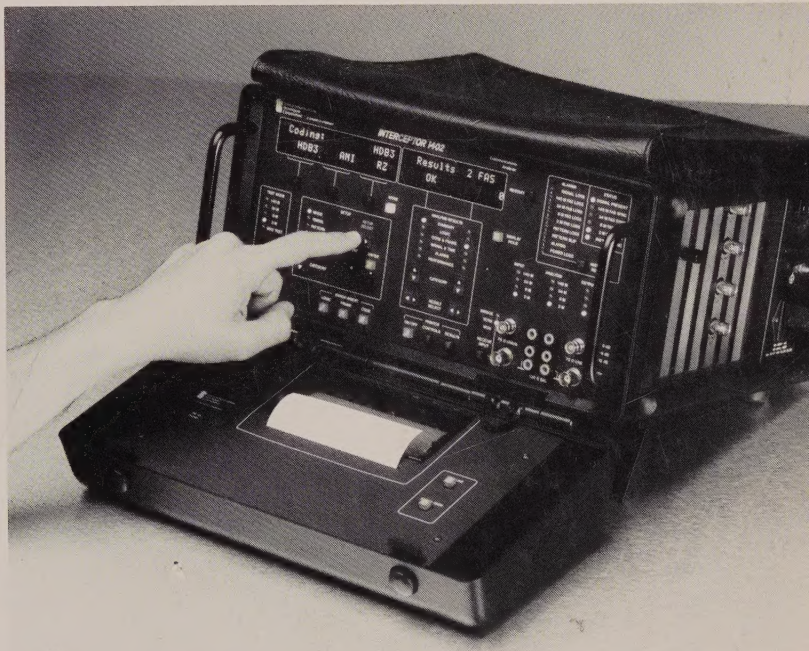


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REFERENCE MANUAL



INTERCEPTOR™ 1402



Telecommunications
Techniques
Corporation®

A DYNATECH COMPANY

... EXPECT EXCELLENCE

ML11660
REV. B
SOFTWARE REVISION 5

INTERCEPTORTM **1402** **REFERENCE MANUAL**

September 1992

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409. The Role of the Earth Sciences	6527
410. The Role of the Atmospheric Sciences	6543
411. The Role of the Oceanic Sciences	6559
412. The Role of the Planetary Sciences	6575
413. The Role of the Astronomical Sciences	6591
414. The Role of the Biological Sciences	6607
415. The Role of the Chemical Sciences	6623
416. The Role of the Physical Sciences	6639
417. The Role of the Earth Sciences	6655
418. The Role of the Atmospheric Sciences	6671
419. The Role of the Oceanic Sciences	6687
420. The Role of the Planetary Sciences	6703
421. The Role of the Astronomical Sciences	6719
422. The Role of the Biological Sciences	6735
423. The Role of the Chemical Sciences	6751
424. The Role of the Physical Sciences	6767
425. The Role of the Earth Sciences	6783
426. The Role of the Atmospheric Sciences	6799
427. The Role of the Oceanic Sciences	6815
428. The Role of the Planetary Sciences	6831
429. The Role of the Astronomical Sciences	6847
430. The Role of the Biological Sciences	6863
431. The Role of the Chemical Sciences	6879
432. The Role of the Physical Sciences	6895
433. The Role of the Earth Sciences	6911
434. The Role of the Atmospheric Sciences	6927
435. The Role of the Oceanic Sciences	6943
436. The Role of the Planetary Sciences	6959
437. The Role of the Astronomical Sciences	6975
438. The Role of the Biological Sciences	6991
439. The Role of the Chemical Sciences	

SECTION 1 GETTING STARTED

1.1 INTRODUCTION

This section contains a functional and physical product description, a features overview, and information describing how to get started using the INTERCEPTOR 1402 Communications Analyzer from TTC. This information includes operating warnings, power requirements self-test, unit test, and set-up procedures for straight-through operation and multiplexing operation.

1.2 FUNCTIONAL DESCRIPTION

The INTERCEPTOR 1402 is a versatile, lightweight test instrument for monitoring, analyzing, and troubleshooting digital communications systems. The INTERCEPTOR can operate as a:

- Dedicated point-to-point test instrument
- Monitor instrument
- Multiplexer/demultiplexer analyzer

Dedicated point-to-point testing allows data at a fixed rate (2.048 Mbit/s, 8.448 Mbit/s, 34.368 Mbit/s, or optionally at 139.264 Mbit/s) to be monitored or tested. For dedicated testing, one data rate is received, analyzed, and transmitted.

Monitor operation allows one tributary from a higher data rate to be monitored in service. If testing is required, the individual tributary can be tested without disrupting traffic flow on the remaining tributaries.

With mux/demux operation selected, the input, analysis, and output data rates can all be different. Multiplex operation allows the INTERCEPTOR to generate a lower input data rate and multiplex it up to a higher output data rate. Demultiplex operation takes a higher data rate and allows one of the four tributaries to be selected for in-service monitoring and live-data testing, while leaving the data undisturbed on all tributaries.

With the 140M option and the Nx64K option installed, it is possible to select a single 64k timeslot within a 140 Mbit/s signal and monitor a voice call on that timeslot.

1.3 PHYSICAL DESCRIPTION

The INTERCEPTOR 1402 dimensions are: 16.5 cm (6.5") high, 35.6 cm (14") wide, and 29.2 cm (11.5") deep. The overall weight, with all options installed, is less than 10 kgs (22 lbs).

A truly modular design allows flexibility in hardware configuration. This enables simple installation and removal of circuit boards, allowing the unit to be user-configured or easily modified by adding options at a later date without being sent to the factory.

The INTERCEPTOR 1402 front panel design groups controls and related functions in operational clusters. This allows both the first-time user and the experienced technician to easily obtain test results when time is critical. Unit controls consist of push-button and rocker switches. Results and operating messages are clearly visible on a dual line, 80-character, vacuum fluorescent display module. The display provides current test result and operating configuration information. Front panel LEDs provide a quick visual indication of the unit operating status, such as test mode, the analysis frequency, alarm status, frame synchronization, input status, and output level.

Connecting a PR-55 lid printer to the INTERCEPTOR front panel PRINTER connector permits hard copies of test results or the unit operating configuration to be generated.

1.4 FEATURES

The INTERCEPTOR 1402 provides the following key features and characteristics:

- Operates at fixed rates of 2 Mbit/s, 8 Mbit/s, or 34 Mbit/s, and optionally at 140 Mbit/s
- Performs multiplexing/demultiplexing
- Performs analysis on live data without disrupting that data
- Performs extensive point-to-point out-of-service data analysis, providing over 80 simultaneous test results
- Allows selection of G.821 (out-of-service), M.550 (in-service or out-of-service), or custom M.550 performance error analysis
- Allows selection of the transmission medium as either coaxial or twisted pair at the 2 Mbit/s data rate
- Can demultiplex a single tributary from a higher data rate down to a single tributary, while not disrupting live data on the other tributaries
- Allows logic, frame, and/or code errors to be inserted

- Generates either fixed data patterns (Mark, Space, 1:1, or 1:4) or pseudorandom patterns (2^6-1 , 2^9-1 , $2^{11}-1$, $2^{15}-1$, $2^{20}-1$, or $2^{23}-1$)
- Provides a Summary Results category to quickly view key results values without having to scan several different categories
- Remote control capability via the RS-232C/V.24 Interface or optional IEEE-488/IEC625 Interface
- Automatically selects the AC line voltage from 100 VAC to 250 VAC

1.5 WARNINGS

The following warnings and precautions must be observed before and during all phases of instrument operation. Failure to comply with these and other specific warnings, contained elsewhere in this manual, may cause physical harm to the operator and/or damage to the instrument. TTC assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis must be connected to an approved three-contact electrical outlet or used with a three-contact to two-contact adaptor with the grounding (earth) wire (the green wire) firmly connected to an electrical ground (safety ground) at the power outlet.

USE THE PROPER FUSE RATING

Line voltage selection is performed automatically. Any line voltage between 100 VAC and 250 VAC that can provide 110 volt-amperes is acceptable. The line fuse (5mm x 20mm) is located inside the side panel power receptacle assembly. The 2A fuse can be accessed by removing the power cord and firmly pulling the fuse assembly out from the side. Never operate the instrument with an improperly rated fuse!

KEEP AWAY FROM LIVE VOLTAGES

Do not remove the instrument top cover or insert fingers or other objects through the side panel holes while power is applied to the unit.

**TURN POWER OFF BEFORE INSERTING
OR REMOVING MODULES**

Do not insert or remove unit modules with power turned on. Be sure power is turned off before installing or removing modules.

**DO NOT OPERATE IN AN AMBIENT
TEMPERATURE ABOVE 50°C**

Do not operate this unit in ambient temperatures that exceed 50°C. Operating this unit in temperatures above 50°C can cause damage.

**DO NOT CONNECT 50Ω CABLES TO THE
75Ω UNBAL CONNECTORS**

Do not connect 50Ω cables to the 75Ω UNBAL input or output connectors. Connecting 50Ω cables to the 75Ω connectors causes damage to the connectors.

1.6 POWER REQUIREMENTS

The unit requires a single phase 50 or 60 Hz power source at 100-250 VAC that can deliver 110 volt-amperes (maximum).

Connect the line voltage to the INTERCEPTOR power receptacle, located on the right side of the unit (when viewed from the front panel). The power module accepts a 50 to 60 Hz, 100 to 250 ($\pm 10V$) VAC signal. No other voltage selection is necessary.

1.7 POWER-UP

The following paragraphs describe the procedures for applying power to the INTERCEPTOR 1402 Communications Analyzer and verifying operation of the unit.

Press the INTERCEPTOR **POWER** switch to the ON position. The power switch is the rocker switch located toward the rear, on the right side of the unit (when viewed from the front panel). The switch uses symbols (1 and 0) to indicate the unit power status.

0 = power turned off

1 = power turned on

Press the rocker switch toward the I position to turn on the INTERCEPTOR power. When turned on, the INTERCEPTOR performs an automatic self-test.

1.7.1 Automatic Self-Test

The automatic self-test consists of a series of diagnostic tests that are performed each time the INTERCEPTOR is powered up. This self test ensures that the INTERCEPTOR is functioning properly. If one portion of this automatic test fails, a message appears in the front panel display window indicating what part of the test failed. Each time the unit is powered up, the automatic self-test verifies the operation of the following:

- All of the discrete LEDs, pushbutton switches with LEDs in them, panel labels that are backlit, and all segments of the vacuum fluorescent display are illuminated for approximately five seconds.
- All of the EPROMs and RAM are checked. If an error is detected, a message appears in the display window. If an error is detected in an EPROM, the unit may not be able to operate. If an EPROM error occurs, contact TTC or your distributor for service.
- Memory is checked at power up to verify that the INTERCEPTOR's last settings (that were stored in memory, prior to powering down) have not been corrupted. This allows all the last operating conditions to be restored at power up. If any changes are detected in memory, a message is displayed for approximately one second indicating what general portion of memory (ROM, RAM, or NOVRAM) failed. When a failure is detected in the NOVRAM, the original factory settings are automatically restored. Even if NOVRAM fails, the INTERCEPTOR can still be fully functional, but the last switch settings may not be saved when power is cycled. However, if a fatal error message is displayed, call TTC or the authorized service center and report the displayed message.
- All of the switches are checked for proper positioning. If a switch is stuck (e.g., pressed but not released) an error message **KEY STUCK - XXXXXXX** is displayed (where **XXXXXXX** represents the name of the stuck key) to indicate which key is stuck. For example, if the **TEST MODE** key was pressed and not released or is held pressed in during power up, the message **KEY STUCK - TEST MODE** is displayed for approximately one second. After the key stuck message is extinguished, the current operating parameters become visible on the display window; the function of the stuck key is then disabled.

1.7.2 Manual Self-Test

Pressing the **SELF LOOP** pushbutton switch initiates a manual self-test. When the **SELF LOOP** switch is pressed, the LED within the switch illuminates and the unit is placed in the self-loop mode. In the self-loop mode, the unit operation is tested by internally looping the transmitter output to the receiver input. While performing a self-loop test, the transmitter and receiver data rates must be the same to allow the unit to properly synchronize. If the user selects different data rates, as is possible during the MUX TEST operating mode, the message **INVALID RCV FREQUENCY** is flashed in the display window on the right. This message is cleared when the receive and transmit data rates are the same.

Getting Started

If the analysis data rate is greater than the received or transmitted data rate, the message **INVALID SETUP** is momentarily displayed on the lower left display and the last data rate entered is not accepted. The last correctly-entered data rate is still in effect.

NOTE: For manual self-test to operate properly, be sure that the RECEIVE INPUT is set to **TERM**.

1.7.3 Fuse Replacement

If the unit front panel LEDs fail to illuminate, verify that the line voltage is present and is 50 Hz to 60 Hz within the range of 100 to 250 (± 10 V) VAC. Make sure that the fuse is not blown. The unit fuse is contained in the power receptacle module. The following procedure describes the steps to verify or replace the fuse.

1. Turn the unit power OFF.
2. Remove the power cord.
3. Insert a narrow flat head screwdriver blade into the slot in the power receptacle module (located in the power connector receptacle closest to the fuse).
4. Apply gentle pressure to unseat the fuse holder.
5. Slide the fuse holder out of the unit.
6. Visually inspect the fuse and verify that it is not blown. If it is blown, replace with a 2TA 250V fuse.
7. Reinsert the fuse holder into the power receptacle module and reset the fuse holder.
8. Reconnect the power cord to the unit.
9. Press the power switch to apply power to the unit.

1.8 UNIT OPERATION VERIFICATION

The following paragraphs describe the operating conventions, the steps required to clear memory (if desired), and to verify operation of the INTERCEPTOR at each of the test mode rates. These tests verify the unit operation at each data rate, along with checking frequency accuracy and output drivers.

1.8.1 Operating Convention

The operating configuration determines INTERCEPTOR operation. Configure the INTERCEPTOR by using the front panel controls or by using a suitable remote controller. Refer to Figure 1-1 for a front panel view and to Figure 1-2 for a side panel view of the INTERCEPTOR 1402.

Two types of switches (pushbutton or rocker) are used to select, control, and display unit operating conditions. Pushbutton switches control the associated function (e.g., ERROR INSERT, PRINTER, DISPLAY HOLD, or MORE) or cycle through a series of function-related choices (e.g., MUX TEST, RECEIVE INPUT, or OUTPUT LEVEL). Rocker switches allow selection of a category or movement through menu choices for a selected category (e.g., **CATEGORY**, **SETUP SELECT**, or **RESULT SELECT**). When more than one set-up menu is available, the **SETUP SELECT** label is backlit. Pressing either arrow on the **SETUP SELECT** switch displays the next menu. **SETUP SELECT** menus and **RESULT SELECT** displays are cyclical. This means that repeatedly pressing the left or right arrow on the associated rocker switch scrolls through all menus for the selected category, and begins cycling through again. Refer to Section 2 for an explanation of the switches and available choices.

1.8.2 Test Configurations

The INTERCEPTOR 1402 can be configured to operate in two basic modes of operation. They are:

- Dedicated - has the same input, analysis, and output data (straight through)
- Mux/Demux - can have different input, analysis, and output data rates

Regardless of which operating mode is selected, there are five basic steps required to perform a test using the INTERCEPTOR 1402. They are:

1. TEST MODE selection - determines the operating mode and data rate(s).
2. Set up the INTERCEPTOR 1402 - there are six categories for configuring the test mode:

- MODE
- TIMING
- PATTERN
- SUMMARY
- RECALL/STORE
- AUXILIARY

3. Select the input termination and output level.
4. Connect the cable(s) to the INTERCEPTOR 1402.
5. Run the test.

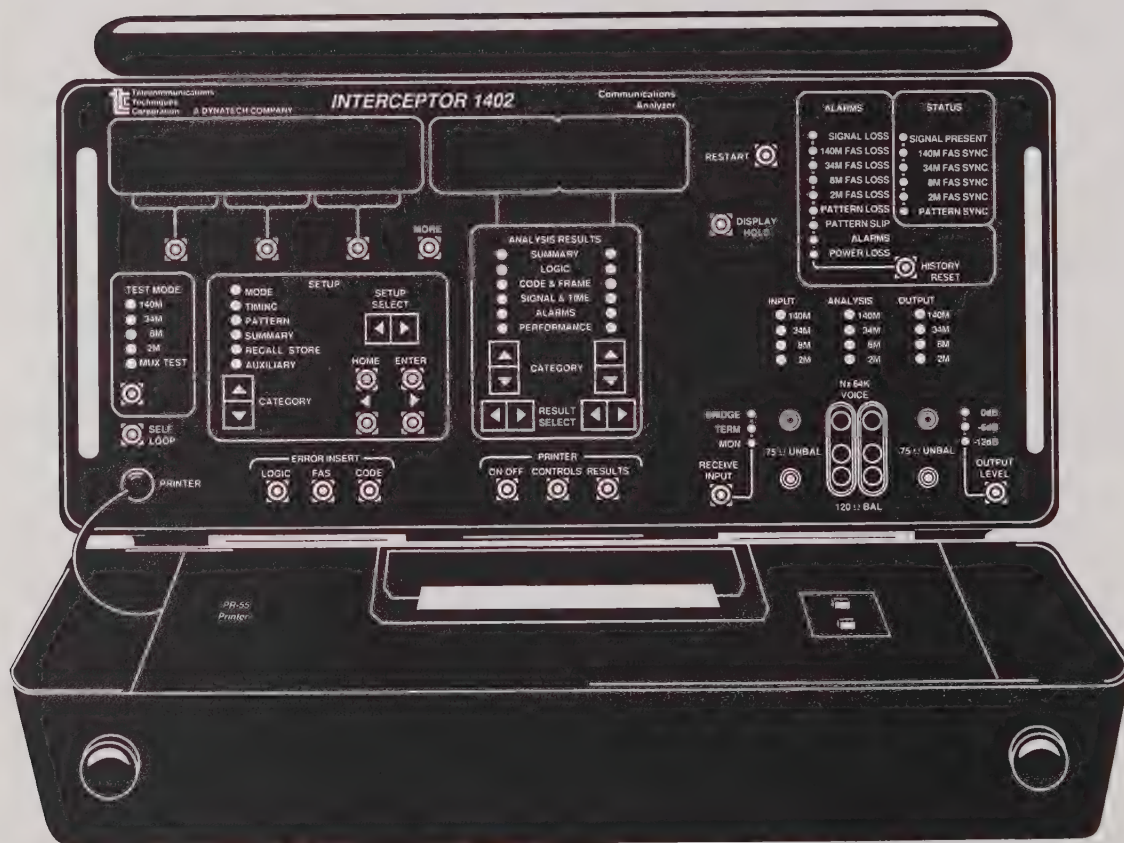


Figure 1-1
INTERCEPTOR 1402 Front Panel

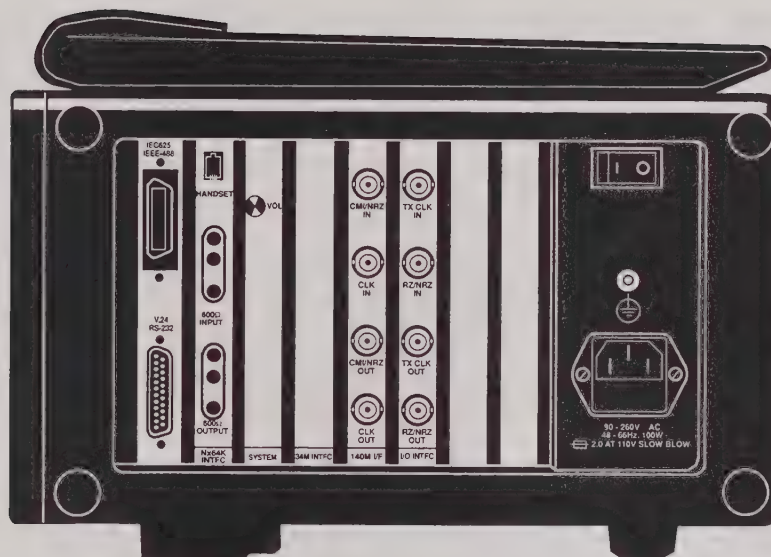


Figure 1-2
INTERCEPTOR 1402 Side Panel

After the basic test set up is completed, the following steps can, if desired, be performed:

1. Analyze the signal.
2. Verify collected test results.
3. Create error conditions.
4. Print out test configurations and/or results.

The following paragraphs describe the two basic operating modes and the steps required to configure the INTERCEPTOR for each mode. The dedicated operating mode is described first, followed by the multiplex/demultiplex operating mode.

1. Dedicated Test Operation

Select the dedicated test operating mode by pressing the front panel TEST MODE switch to illuminate the LED next to one of the following labels:

- 2M
- 8M
- 34M
- 140M (if the 140M option is installed)

Pressing the **TEST MODE** switch to illuminate the LED next to the 2M label selects the dedicated 2.048 Mbit/s operating mode. Observe the three columns of LEDs below the INPUT, ANALYSIS, and OUTPUT labels (located at the right on the front panel). The LEDs next to the 2M labels illuminate when the 2M dedicated mode is selected. Similarly, selecting one of the other dedicated data rates illuminates one of the corresponding LEDs.

With the desired dedicated data rate selected, press the **CATEGORY** rocker switch, in the **SETUP** block, below the six set-up categories. Pressing this rocker switch scrolls through the following set-up categories:

- MODE displays accompanying mode-specific menus.
- TIMING displays the timing source selections.
- PATTERN displays the selected transmission pattern.
- SUMMARY displays a quick overview of the operating mode.
- RECALL/STORE store and recall unit operating configurations.
- AUXILIARY displays less frequently used configuration choices.

The LED illuminates next to the selected category. With the desired category selected, press the **SETUP SELECT** rocker switch to scroll through the accompanying menus for the selected category.

2. Multiplex/Demultiplex Test Operation

Pressing the **TEST MODE** switch to illuminate the LED next to the MUX TEST label selects the mux/demux operating mode. In the mux/demux operating mode, press the **SETUP CATEGORY** rocker switch to illuminate the LED next to the MODE label.

When the MODE category is selected, the current input, analysis, and output data rates are visible in the display window. The softkeys, located below the menu item choices on the bottom line of the display, can be pressed to scroll through the corresponding menu item choices. The mux/demux choices are as follows:

<u>Input</u>	<u>Analys</u>	<u>Output</u>
140M*	140M*	140M*
34M	34M	34M
8M	8M	8M
2M	2M	2M
	Nx64†	2MRx
		=Rx

* Only displayed if the 140M option is installed.
† Only displayed if the Nx64K option is installed.

Pressing a softkey below one of the three menu item choices scrolls that menu item to its next available selection. Changing a displayed mux/demux menu item causes the LED in the **ENTER** switch to illuminate. Press the **ENTER** switch to indicate that the displayed mux/demux menu choices are correct. If the **ENTER** switch is not pressed, pressing the **SETUP SELECT** rocker switch displays the following message in the display window:

<ENTER> CHANGES?

Yes No

Press the softkey below the desired action. Pressing the softkey below the **Yes** menu item saves the new mux/demux data rates. Pressing the softkey below the **No** menu item returns the mux/demux menu choices to the rates before any changes were made.

If the selected analysis rate is greater than the input or output rate, the message **INVALID SETUP** is visible in the display window for approximately 4 seconds.

The invalid setup is not saved and the last valid data rates are again visible in the display.

When the **SELF LOOP** switch is pressed and the MUX TEST mode is selected, the Rx (input) and Tx (output) data rates must be the same. If these data rates are not the same, the message **INVALID RCV FREQUENCY** is visible in the results window.

Once the SELF LOOP mode is disabled, the Tx and Rx data rates can once again be set to different rates.

The displayed menus and menu item choices are determined by the selected input, analysis, and output rates. Figure 1-3 illustrates many of the menu display combinations for a mux/demux setup with 34M Input, 2M Analysis, and 34M Output data rates.

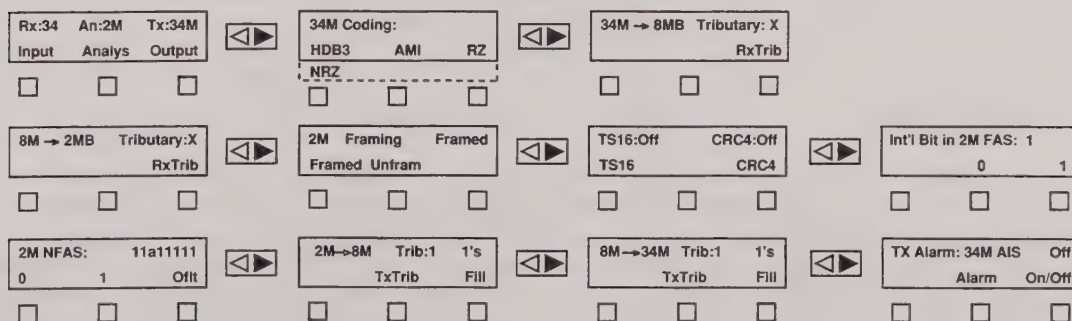


Figure 1-3
Mux/Demux Menus

1.8.3 Beginning a Test

After configuring the INTERCEPTOR for the test to be performed, press the **RESTART** switch to:

- Clear all accumulated result values
- Reset illuminated ALARM LEDs
- Force pattern and frame resynchronization

Result values begin to accumulate simultaneously for the test in progress. The **ANALYSIS RESULTS** rocker switches (**CATEGORY** and **RESULT SELECT**) can be used to view accumulated results.

Changing the **RECEIVE INPUT** (BRIDGE, TERM, or MON) also clears all accumulated result values.

1.8.4 Results Analysis

For any test in progress, the **ANALYSIS RESULTS** rocker switches (**CATEGORY** and **RESULT SELECT**) can be used to view accumulated results. The **CATEGORY** rocker switches select the category and the **RESULT SELECT** switches scroll through the selected category. Two result values can be displayed simultaneously in the display window above the ANALYSIS RESULTS section.

The left **CATEGORY** and **RESULT SELECT** rocker switches control the results visible in the left result display window. Similarly, right **CATEGORY** and **RESULT SELECT** rocker switches control the results visible in the right result display window.

An individual result can be selected from two different result categories. This allows the user to view one or two results of particular interest simultaneously. For example, the left **CATEGORY** and **RESULT SELECT** rocker switches can be used to display the TIME item from the SIGNAL & TIME category, and the right **CATEGORY** and **RESULT SELECT** rocker switches can be used to display the BIT ERRS item in the LOGIC category.

1.8.5 Display Hold

Pressing the **DISPLAY HOLD** switch “freezes” the displayed results values at that point in time and illuminates the LED in this switch. This allows the **CATEGORY** and **RESULT SELECT** rocker switches, respectively, to select a results category and scroll through the values of the results category items at the time they were halted. Even though the displayed results are halted, results values continue to accumulate because the test is still in progress. Accumulating results are stored in memory until the DISPLAY HOLD is disabled by pressing this switch again. This extinguishes the LED inside the **DISPLAY HOLD** switch and updates the results to show their current values. Pressing the **TEST MODE** switch while the display hold is enabled causes a test restart and clears the display hold.

1.8.6 Clearing Memory

This test clears the current operating parameters stored in memory and returns the unit operation to the default values stored in memory. Clearing the memory resets all operating parameters to the factory default values listed in Appendix C.

NOTE: Clearing the memory deletes all user-stored configurations. If you do not want to clear stored configurations, do not clear memory.

1. Turn the unit power ON.
2. Press the **SETUP CATEGORY** switch to illuminate the LED next to the AUXILIARY label.
3. Press the left **SETUP SELECT** switch until **CLEAR MEMORY?** is visible in the display window.
4. Press the softkey below **YES**, visible on the bottom line, and the message **ARE YOU SURE?** is displayed on the top line.
5. Press the softkey below **YES**, visible on the bottom line, to clear memory.

1.9 PERFORMING A TEST WITH THE INTERCEPTOR 1402

Performing a test with the INTERCEPTOR 1402 involves these basic steps.

1. Selecting the TEST MODE
2. Configuring the INTERCEPTOR 1402
3. Confirming the test set-up
4. Cabling the INTERCEPTOR 1402
5. Running the test
6. Analyzing signal status
7. Collecting test results
8. Error insertion
9. Printing test results

Figure 1-4 shows the INTERCEPTOR 1402 front panel controls. The numbers for each item in the figure correspond to the front-panel component that controls each basic step listed previously.

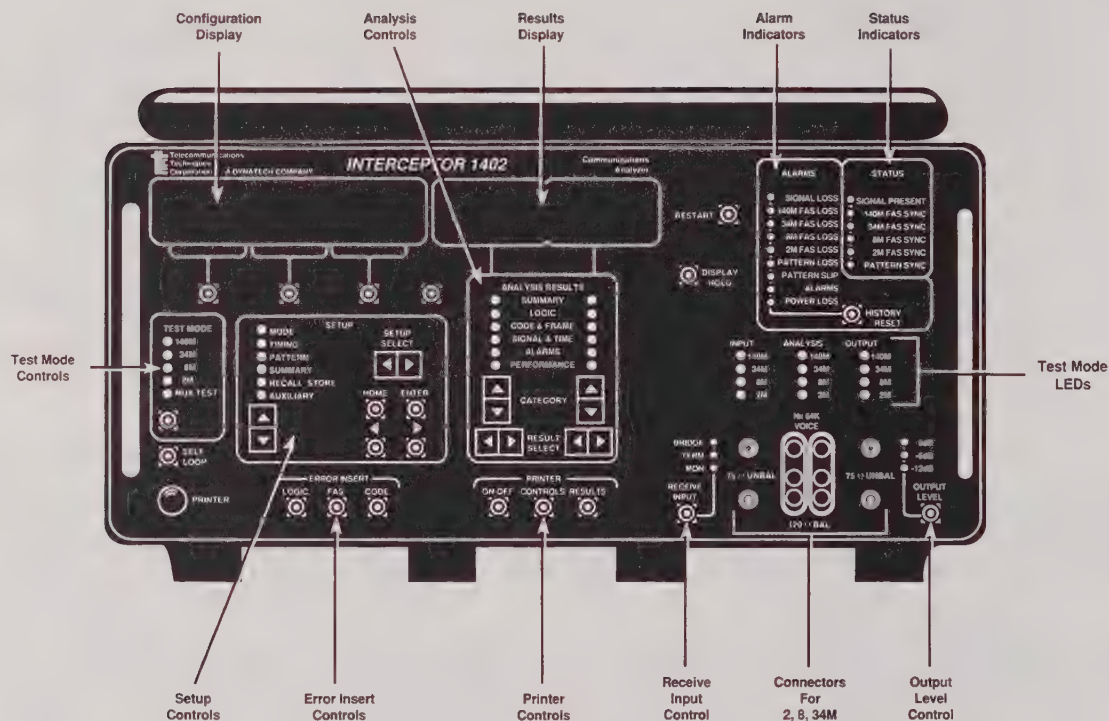


Figure 1-4
INTERCEPTOR 1402 Front Panel Controls

NOTE: This section only describes the parts of the INTERCEPTOR 1402 front panel that are essential for test set-up and analysis. Refer to Section 2 for additional information about the instrument front panel switches.

1. Selecting the TEST MODE

The **TEST MODE** switch determines whether the INTERCEPTOR functions as a dedicated test instrument or as a multi-rate test instrument with a built-in multiplexer/demultiplexer. This switch controls the test mode selection. The LED illuminated next to the test mode label indicates the current test mode. Pressing this switch scrolls to the next available mode selection and illuminates its LED.

2. Configuring the Test Set-up

Visually inspect the INTERCEPTOR 1402 front panel display and indicators to assure the unit has been properly set for the test to be performed. The SETUP panel and display section determines the operating configuration for the selected TEST MODE. The **CATEGORY** rocker switch is used to scroll through the categories (MODE, TIMING, PATTERN, SUMMARY, RECALL/RESTORE, and AUXILIARY) above this switch. The selected category is indicated by the illuminated LED next to the selected category label. The SETUP SELECT label is backlit when additional menus are available for the selected category. Press the left or right arrow on the **SETUP SELECT** rocker switch to scroll through the other menus. When SETUP SELECT is not backlit, no additional menus are available. The selected category menu is visible in the display window above the **SETUP** switches.

3. Confirming the Test Set-up

The RATE indicator panel displays the current INTERCEPTOR configuration (see Figure 1-5). These indicators display the currently selected INPUT, ANALYSIS, and OUTPUT rate(s). Use these indicators to confirm the INTERCEPTOR test set up.

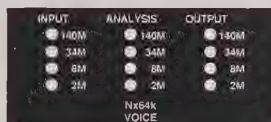


Figure 1-5
Rate Indicators

4. Connecting the INTERCEPTOR 1402

To connect the INTERCEPTOR to the circuit under test, use the connectors and switches located at the lower right corner on the front panel (see Figure 1-6). To connect the INTERCEPTOR, follow these steps:

- Set the RECEIVE INPUT (BRIDGE, TERM, or MON)
- Set the OUTPUT LEVEL (0, -6, or -12 dB)
- Cable the INTERCEPTOR to the appropriate connector (75Ω UNBAL, or 120Ω BAL)

NOTE: If 140M mode is selected, the input and output signal connectors are located on the side panel. BRIDGE is not available as a RECEIVE INPUT selection when 140M is selected. The only OUTPUT LEVEL selection for 140M operation is 0 dB.



Figure 1-6
Input/Output Connectors

RECEIVE INPUT - Press the **RECEIVE INPUT** switch to select the input impedance and signal conditioning (BRIDGE, TERM, MON).

BRIDGE - Select **BRIDGE** to connect the **INTERCEPTOR** to an already correctly terminated circuit without disrupting traffic. (This selection is not available for 140M operation.) Also, this option disconnects the 75 Ω termination.

TERM - Select **TERM** to allow the **INTERCEPTOR** to terminate a circuit.

MON - Select **MON** to connect the **INTERCEPTOR** to a monitor access point that has from 20 dB to 30 dB of resistive loss. See the description of the **AUX** menu in this section for a further selection of monitor requirements.

OUTPUT LEVEL - Press the **OUTPUT LEVEL** pushbutton switch to select the cable loss for the selected rate (0 dB, -6 dB, or -12 dB). The selected cable loss only affects the transmit data. With 140M selected as the output rate, only 0 dB is available for the output level.

Cable the INTERCEPTOR - Select either the 75 Ω or the 120 Ω connector. With 140M selected, the signal is connected to the side panel connector(s).

75 Ω The 75 Ω connectors operate in unbalanced mode at 2M, 8M, 34M, and 140M. The BNC or 1.6mm x 5.6mm connector shield connects to ground, and the center conductor carries the signal.

NOTE: To prevent connector damage, do not connect a 50 Ω cable to this connector.

120 Ω The 120 Ω connectors operate in balanced mode at 2M. The connector is a three-prong banana plug.

5. Running the Test

Once you have set up your test and cabled the INTERCEPTOR 1402 for the test you wish to run, the test starts automatically, or begin the test by pressing the **RESTART** switch. Pressing the **RESTART** switch automatically clears all results counters and alarms.

6. Analyzing Signal Status

Use the ALARMS and STATUS LEDs to observe the current and past signal conditions. The ALARM LED will illuminate if an alarm occurs. To clear ALARMS that have previously occurred, press the **HISTORY RESET** switch (see Figure 1-7).

The STATUS LEDs indicate when:

- ALARMS and STATUS LEDs: SIGNAL is PRESENT
- ALARMS and STATUS LEDs: FAS SYNC for each rate is present
- ALARMS and STATUS LEDs: PATTERN SYNC is present

The ALARMS LEDs indicates when:

- SIGNAL PRESENT is lost
- FAS SYNC for each rate is lost
- PATTERN SYNC is lost
- ALARMS occurred
- POWER LOSS occurred

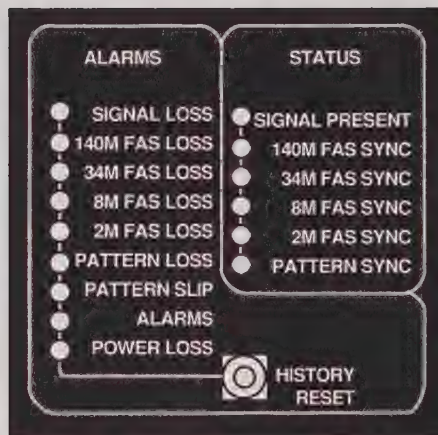


Figure 1-7
ALARM and STATUS LEDs Panel

7. Collecting Test Results: The ANALYSIS RESULTS Panel and Display Section

The INTERCEPTOR 1402 ANALYSIS RESULTS panel and display section selects and displays two results simultaneously (see Figure 1-8). There are four major parts:

- **CATEGORY** switches
- **RESULT SELECT** switches
- ANALYSIS RESULTS display
- **DISPLAY HOLD** switch

The left and right **CATEGORY** rocker switches are used to select and display an ANALYSIS RESULTS category. The left and right **RESULT SELECT** rocker switches are used to scroll and select the specific analysis results available in each category. The left and right ANALYSIS RESULTS displays show the currently selected test results. The left **CATEGORY** and **RESULT SELECT** rocker switches control the left display; the right **CATEGORY** and **RESULT SELECT** rocker switches control the right display.

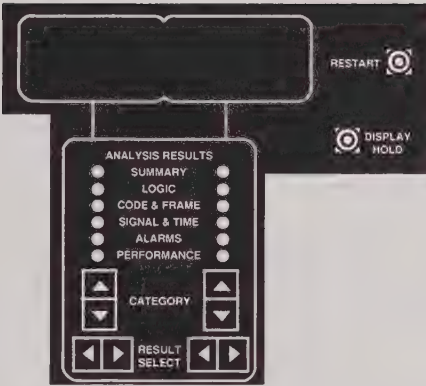


Figure 1-8
ANALYSIS RESULTS Panel and Display Section

NOTE: Both sides of the ANALYSIS RESULTS section operate the same, and offer the same analysis categories and results.

A time-saving feature of the ANALYSIS RESULTS is the SUMMARY results category. This feature allows you to view key non-zero measurements without scrolling through the other results categories. When the SUMMARY category is selected and all summary results are error-free, the message **RESULTS OK** appears in the display. If errors are detected, they will automatically be displayed. You may then use the **CATEGORY** switch to scroll to the appropriate ANALYSIS RESULTS category (or categories) for more information.

The **DISPLAY HOLD** switch halts only the display of test results, it does not halt the test in progress. This allows results information which was current at the time the switch was pressed to be frozen and examined, without interrupting the test.

Table 1-1 lists the test results that are available in each ANALYSIS RESULTS category. The non-zero results that are recorded in the SUMMARY category are included.

NOTE: The test measurements that are actually available will vary with the TEST MODE selected and the test performed.

Table 1-1
Analysis Categories and Results (Continued)

Use This CATEGORY Switch:	To View this Result:
PERFORMANCE (M.550 Results)	Def S (Defect Second)* SES (Severely Errored Seconds)* % SES (% Severely Errored Seconds)* MRER (Mean Residual Error Rate) * Results are prefixed with the appropriate rate.

8. Error Insertion

Once you have begun a test you can test the circuit using the ERROR INSERT controls. The **ERROR INSERT** switches enable the insertion of errors into the data stream. These push-button switches may be used individually or in combination to insert logic, frame, and code errors simultaneously. The following paragraphs describe the three **ERROR INSERT** pushbutton switches.

Press the **LOGIC ERROR INSERT** switch momentarily to insert a single logic error. Press the **LOGIC** switch for longer than a second, to continuously insert logic errors at the rate selected in **AUXILIARY CATEGORY**.

NOTE: The LED in this switch illuminates when continuous error insertion is selected.

Press the **FAS** switch momentarily to insert either 1, 2, 3, or 4 adjacent frame errors. The number of FAS errors inserted is selected in the **AUXILIARY CATEGORY**. Press and hold the **FAS** switch for more than one second, to continuously insert the selected number of frame errors at the rate selected in the **AUXILIARY CATEGORY**.

NOTE: The LED in this switch illuminates when continuous error insertion is selected.

Press the **CODE** switch momentarily to insert a single code error. Press and hold the **CODE** switch for longer than a second to continuously insert code errors at the rate selected in the **AUXILIARY CATEGORY**.

NOTE: The LED in this switch illuminates when continuous error insertion is selected.

9. Printing Test Results: The Printer Controls

The **PRINTER** controls contain three switches that generate various printouts. The following paragraphs describe the **PRINTER** controls and front panel **PRINTER** connector.

ON/OFF switch enables or disables the automatic printouts configured in the **AUXILIARY** menu (status prints, timed prints, and error prints).

CONTROLS switch sends the current test instrument configuration to the printer.

RESULTS switch sends the current test result values to the printer.

The front panel **PRINTER** connector is an eight-pin RS-232 serial port that supplies power, control, and data leads to the PR-55 lid printer.

1.10 DEDICATED TESTING

Any available rate can be selected for dedicated testing, from 140M to 2M. It is important to understand that the following test scenarios are only examples used to familiarize you with the operation of the INTERCEPTOR 1402. The menus displayed depend on the data rate selected, and menu choices made. For additional information on menus and choices, refer to Section 2.

1.10.1 In-Service Analysis

Monitoring live data is the first step in fault isolation. With the INTERCEPTOR 1402, you can monitor live data at any access point along the network to obtain information on Code Errors, FAS Errors, CRC Errors, REBEs, Network Alarms, Frequency, and to perform an in-service M.550 performance analysis. Figure 1-9 shows the INTERCEPTOR 1402 performing M.550 in-service analysis. Note that this set-up tests 140M, 34M, 8M, 2M and 64k simultaneously. Table 1-2 provides step-by-step instructions for performing this test with the INTERCEPTOR 1402.

Table 1-2
Performing an In-Service Test With the INTERCEPTOR 1402

Step:	Activity:
1.	Turn the power switch ON.
2.	If testing one rate at a time, set the TEST MODE switch to 2M, 8M, 34M, or 140M depending on the monitoring point. Although any rate can be selected, for purposes of example only, set the INTERCEPTOR as follows.
3.	Set the SELF LOOP switch to OFF.
4.	Set the SETUP CATEGORY switch to MODE.

Table 1-2
Performing an In-Service Test With the INTERCEPTOR 1402 (Continued)

Step:	Activity:
5.	Using the SETUP SELECT switch and the softkeys below the SETUP display, configure the MODE menu as follows: Select: A. Set Input equal to 140M. B. Set Analysis equal to Nx64. C. Set Output equal to 34M (since only monitoring - and not using a transmitted signal - this value need not be set). D. Press the ENTER key. E. Press the right half of the SETUP SELECT switch. F. Set 140M Coding to CMI or NRZ. If Input is other than 140M, the Coding choices are: HDB3, AMI,RZ, or NRZ. G. Press the right half of the SETUP SELECT switch. H. Set 140M>34M RxTrib equal to 2. I. Press the right half of the SETUP SELECT switch. J. Set 34M>8M RxTrib equal to 3. K. Press the right half of the SETUP SELECT switch. L. Set 8M>2M RxTrib equal to 4. M. Press the right half of the SETUP SELECT switch. N. Set TS16 and CRC4 Off. O. Press the right half of the SETUP SELECT switch. P. Set the International bit in 2M FAS to 1 or 0. Q. Press the right half of the SETUP SELECT switch. R. Set the 2M NFAS bits to 1 or 0. Press the ENTER switch after changing any bitvalue. S. Press the right half of the SETUP SELECT switch. T. Set the Analysis mode to Nx64. U. Press the right half of the SETUP SELECT switch. V. Set the Rx/Tx TS Coupling to On. W. Press the right half of the SETUP SELECT switch. X. Set the 1stTS as desired. Press the MORE switch and set Fill to 1's. a. Press the right half of the SETUP SELECT switch. b. Set the 2M>8M TxTrib equal to 4 and set Fill to 1's. c. Press the right half of the SETUP SELECT switch. d. Set 8M>34M TxTrib equal to 1 and set Fill to 1's. e. Press the right half of the SETUP SELECT switch. f. Set 34M>140M TxTrib equal to 2 and set Fill to 1's. g. Press the right half of the SETUP SELECT switch to return to the HOME menu.
6.	Set the SETUP CATEGORY switch to AUXILIARY.

Table 1-2
Performing an In-Service Test With the INTERCEPTOR 1402 (Continued)

Step:	Activity:
7.	Press the SETUP SELECT switch to display the Performance menu.
8.	Press the right-most softkey to select M.550 in-service performance analysis.
9.	Set the RECEIVE INPUT switch to MON.
10.	Press the right half of the SETUP SELECT switch.
11.	Set the all the TX Alarms to Off.
12.	Using the appropriate cables for the data point being monitored, connect the INTERCEPTOR 1402 to the equipment under test. Since this is a monitor test, be sure to connect to a monitor point with a resistive loss from -20 to -30 dB. Also, be sure to use a monitor that will not disrupt the in-service traffic.
13.	Press the RESTART switch to begin the test.
14.	If a hard copy of the test results is desired, set the PRINTER ON/OFF switch to ON, then press the RESULTS printer switch. Status, error, and timed print events can be customized using the AUXILIARY CATEGORY .

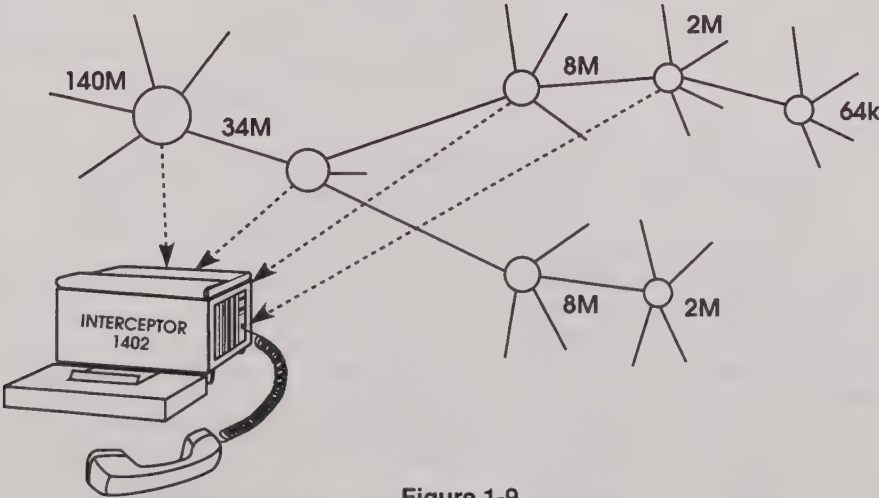


Figure 1-9
In-Service Analysis

CAUTION:

Whenever connecting the INTERCEPTOR 1402 for in-service testing, be sure to use a monitor that will not disrupt the in-service traffic.

1.10.2 Point-To-Point (Out of Service) Testing

Point-to-point testing with the INTERCEPTOR 1402 verifies that the data received at one point is the exact data transmitted from another point. The INTERCEPTOR can test a single tributary from any access point to isolate circuit sections and pinpoint problems. Figure 1-10 illustrates an INTERCEPTOR 1402 testing a single 2M tributary for bit and code errors, framing, frequency, and pattern slip measurements between two points in both directions simultaneously.

The following procedure provides step-by-step instructions for performing this test with the INTERCEPTOR 1402.

Table 1-3
Performing an Out of Service Test With the INTERCEPTOR 1402

Step:	Activity:
1.	Turn the power ON.
2.	Set the TEST MODE switch to the selected data rate. Although any rate can be selected, for purposes of example only, select 2M.
3.	Set the SETUP CATEGORY switch to MODE.
4.	Using the SETUP SELECT switch and the softkeys below the SETUP display, configure the MODE menu as follows. A. Select Framed or Unframed. B. Press the right half of the SETUP SELECT switch. C. Set 2M Coding to HDB3, AMI, RZ, NRZ, or CMI (140M). D. Press the right half of the SETUP SELECT switch. E. If monitoring at 2M Framed, set TS16 and CRC4 On or Off. F. Press the right half of the SETUP SELECT switch. G. Set 2M I/O Format to 75Ω or 120Ω, whichever is appropriate. H. Press the right half of the SETUP SELECT switch. I. Set the International bit in 2M FAS to either 1 or 0 (only displayed if CRC4 is set Off). J. Press the right half of the SETUP SELECT switch. K. Set the 5 least significant bits of the 2M NFAS to 1 or 0 (the default is 11a11111). L. Press the right half of the SETUP SELECT switch. M. Set the TX alarm status On or Off. N. Press the right half of the SETUP SELECT switch to return to the HOME menu.

Table 1-3
Performing an Out of Service Test With the INTERCEPTOR 1402 (Continued)

Step:	Activity:
5.	Set the SETUP CATEGORY switch to TIMING.
6.	Using the softkeys below the SETUP display, set the TIMING menu to Int, Rec, or Ext. NOTE: If both INTERCEPTORs are using REC TIMING there must be a timing source in the network. If Ext is selected there must be a clock provided on the EXT CLK IN BNC connector.
7.	Set the SETUP CATEGORY switch to PATTERN.
8.	Using the MORE key and the appropriate softkey below the SETUP display, select the appropriate data pattern.
9.	Set the RECEIVE INPUT switch to TERM.
10.	Set the OUTPUT LEVEL switch to the desired level (0 dB, -6 dB, or -12 dB).
11.	Using the appropriate cables for the data being monitored, connect the INTERCEPTOR 1402 to the equipment under test.
12.	Press the RESTART switch to begin the test.
13.	Verify that: • The SIGNAL PRESENT green LED is illuminated. • The appropriate FAS SYNC green LED is illuminated if framing is selected. • The PATTERN SYNC green LED is illuminated.
14.	Set the ANALYSIS RESULTS CATEGORY switch to SUMMARY. Verify the results.
15.	If a hard copy of the test results is desired, set the PRINTER ON/OFF switch to ON and press the RESULTS switch. Status, error, and timed print events can be customized using the AUXILIARY CATEGORY.

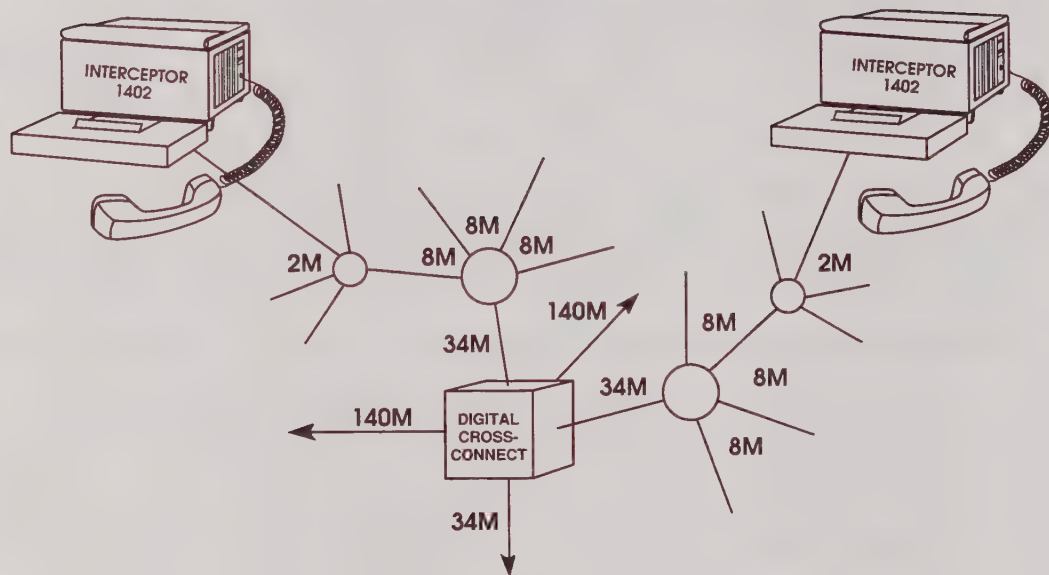


Figure 1-10
Point-to-Point Testing

SECTION 2

INSTRUMENT DESCRIPTION

2.1 INTRODUCTION

This section provides the INTERCEPTOR 1402 identification plate location, specifications, a description of switches and indicators, operation at 2M, 8M, 34M, or 140M for dedicated testing, and mux/demux testing.

2.2 INSTRUMENT IDENTIFICATION PLATES

An identification plate is attached to the side panel of each INTERCEPTOR. The instrument serial number and line voltage input requirements are inscribed on this plate. This serial number should be included on all correspondence with TTC concerning the particular instrument. In addition, the INTERCEPTOR 1402 has an option identification plate, which lists the factory-installed options.

2.3 SPECIFICATIONS

The following paragraphs list the INTERCEPTOR 1402 Communications Analyzer specifications:

ANALYSIS RATES

Dedicated Analysis Rates:

- 2M (2.048 Mb/s)
- 8M (8.448 Mb/s)
- 34M (34.368 Mb/s)
- 140M (139.264 Mb/s) optional

Valid Analysis Rates (when multiplexing/demultiplexing):

- 2M (2.048 Mb/s)
- 8M (8.448Mb/s)
- 34M (34.368Mb/s)
- 140M (139.264Mb/s) optional

NOTE: The analysis rate may never be higher than the input or output rate.

TRANSMITTER

Output Connector

2M

- 120 ohm banana jacks

2, 8, 34M

- 75 ohm unbalanced BNC
- 75 ohm unbalanced 1.6 / 5.6 mm

140M option (connector located on side panel)

- 75 ohm unbalanced BNC *or*
75 ohm unbalanced 1.6 / 5.6 mm (option)

Clock Sources

- Fixed internal frequencies
- Recovered from received signal
- External BNC

Internal Frequencies

- 2.048 MHz ± 5 ppm
- 8.448 MHz ± 5 ppm
- 34.368 MHz ± 5 ppm
- 139.264 MHz ± 10 ppm

Coding

2M, 8M, or 34M

- HDB3, AMI, RZ, or NRZ

140M option

- CMI or NRZ

Output Attenuation

2M, 8M, or 34M

- 0 dB, -6 dB, or -12 dB cable loss simulation

140M option

- 0 dB only

RECEIVER**Input Connector****2M**

- 120 ohm banana jacks

2M, 8M, 34M

- 75 ohm unbalanced BNC
- 75 ohm unbalanced 1.6 / 5.6 mm

140 M option (connector located on the side panel)

- 75 ohm unbalanced BNC *or*
75 ohm unbalanced 1.6 / 5.6 mm (option)

Input Sensitivity

- BRIDGE and TERM: +6 to -25 dB at 2.048 Mb/s (balanced), 0 to -12 dB at 2.048 Mb/s (unbalanced); 0 to -12 dB at 8.448 Mb/s, 34.368 Mb/s, and 139.264 Mb/s. (BRIDGE not available for 140M.)
- MONITOR: Adds up to 30 dB of flat gain at all data rates. The 34M Mon Pt (auxiliary function) permits compensation for resistive only or resistive and cable signal attenuation.

Input Impedance

- Unbalanced MONITOR and TERM: 75 ohms at 2.048 Mb/s, 8.448Mb/s, 34.368 Mb/s, and 139.264 Mb/s. BRIDGE: Greater than 1000 ohms at 2.048 Mb/s, 8.448 Mb/s, 34.368 Mb/s, and 139.264 Mb/s.
- Balanced MONITOR and TERM: 120 ohms at 2.048 Mb/s only. BRIDGE: Greater than 1000 ohms at 2.048 Mb/s only.

DATA GENERATOR**Fixed Patterns**

- Mark, Space, 1:1, 1:3, 1:4, or programmable 3- to 24-bit repeating pattern

Pseudorandom Patterns

- 2⁶-1, 2⁹-1, 2¹¹-1, 2¹⁵-1, 2²⁰-1, 2²³-1. See the following list:

Pseudorandom Patterns (continued):

Pattern:	Standard/Source:
2 ⁶ -1	Q6 + Q5
2 ⁹ -1	CCITT V.52
2 ¹¹ -1	CCITT O.152
2 ¹⁵ -1	CCITT O.151
2 ²⁰ -1	CCITT V.57
2 ²³ -1	CCITT O.151

Pattern Sync Acquisition

- Fixed Pattern Data: 30 consecutive bits with no errors
- Pseudorandom Patterns: 30 + n consecutive bits with no errors for a 2ⁿ-1 pattern
- When using M.550 Performance Analysis: One test second with a Bit Error Ratio of less than 20%

Pattern Sync Loss Criteria

- 250 bit errors in less than 1000 bits (G.821 Performance mode).
- One test second with a Bit Error Ratio greater than or equal to 20% (M.550 Performance mode).

ERROR INSERTION

Logic

Logic Error Insertion:

- Single error or continuous errors at a selectable rate

FAS

Frame Error Insertion:

- 1 to 4 consecutive FAS words errored, either as a single event or continuously at a programmable rate

Code

Code Error Insertion:

- Single error or continuous errors occurring at a selectable rate

FREQUENCY MEASUREMENT

Frequency Measurement
Range:

- 2.048 Mb/s to 139.264 Mb/s, ± 5 ppm (± 1 ppm optional)

PRINTER/REMOTE CONTROL INTERFACES

RS-232/V.24

Baud Rate:
Word Length:
Parity:
Line Terminators:
Line Width:
Connector Type:

- 300, 1200, 4800, or 9600
- 7 or 8 bits
- Even, odd, or none
- Carriage return, line feed or carriage return/line feed
- 40 or 80 characters
- 25-pin, D-type, female (DCE)

IEEE-488/IEC625 (Optional)

Word Length:
Line Terminators:
Line Width:
Connector Type:

- 8 bits
- Carriage return, line feed or carriage return/line feed
- 40 or 80 characters
- Standard IEEE-488 connector

MISCELLANEOUS INPUT/OUTPUT

TX CLK IN BNC Connector

2M, 8M, 34M

140M (option)

Input Connector:
Outer Conductor:
Inner Conductor:
Input DC Impedance:
Input AC Impedance:
Input Signal Range:

- | | |
|------------------|------------------|
| • BNC | • BNC |
| • Ground | • Ground |
| • Signal | • Signal |
| • 1000 ohms | • 1000 ohms |
| • 75 ohms | • 75 ohms |
| • TTL compatible | • ECL compatible |

TX CLK OUT BNC Connector

2M, 8M, 34M

140M (option)

Input Connector:
Outer Conductor:
Inner Conductor:
Output Load:
Output Signal Level

- | | |
|--------------------|--------------------|
| • BNC | • BNC |
| • Ground | • Ground |
| • Signal | • Signal |
| • 75 ohms, minimum | • 75 ohms, minimum |
| • TTL compatible | • ECL compatible |

RZ/NRZ IN BNC Connector

Input Connector:
Outer Conductor:
Inner Conductor:
Input DC Impedance:
Input AC Impedance:
Input Signal Range:

2M, 8M, 34M

- BNC
- Ground
- Signal
- 75 ohms
- 75 ohms
- TTL compatible

140M (option)

- BNC
- Ground
- Signal
- 75 ohms, minimum
- 75 ohms
- ECL compatible

GENERAL

Programmability

Front Panel Programs:

- Stores, recalls, and names up to ten complete instrument configurations.

Non-Volatile Memory

Information Stored:

- Stores current front panel switch settings, keypad entries, auxiliary function settings, active test results, and print buffer or histogram storage buffer.

Remote Control Capability

Remote Control Access:

- RS-232D/V.24 Printer/Remote Control Interface built-in
- IEEE-488/IEC625 Interface (optional)

Audio Indicator

Speaker:

- Generates tones that indicate test events with volume control

Display

Display Type:
Display Size:
Character Font:

- Vacuum fluorescent display
- 80 characters (40 characters x 2 lines)
- 5 x 7 dot matrix and cursor

Power Requirements

Voltage:	• 100 to 250 VAC, $\pm 10\%$
Frequency:	• 50 to 60 Hz
Power:	• 110 volt-amperes, maximum

Environmental Specifications

Operating Temperature Range:	• 0°C to 50°C (32°F to 124°F)
Storage Temperature Range:	• -30°C to 75°C (-22°F to 167°F)

Dimensions and Weight

Size:	• 16.5 cm high, 35.6 cm wide, and 29.0 cm deep (6.5" H x 14" W x 11.5" D)
Weight:	• 7.9 kgs (17.5 lbs.) • 9.2 kgs (20.5 lbs.) with all options installed

2.4 CONTROLS

The following paragraphs describe the INTERCEPTOR 1402 front panel display, controls, and indicators.

2.4.1 Front Panel Display

The display consists of an 80-character, alphanumeric, vacuum fluorescent display module. It provides a visual indication of the unit's operating status and menu selections available for the current configuration. The top line of the menu displays the present selection, the bottom line displays the available selections.

Each line of the VF display window has two 40-character display elements. Each element is a 5x7 dot segment. The VF display window is divided into three operational sections. The left half of the window displays set-up menus on the top line and menu choices on the bottom line. The right half of the window displays accumulated results. The top line displays the result name and the bottom line displays the accumulated result value. When a result value overflows the designated eight-digit display, the result automatically changes to exponential notation, and the result value continues to accumulate.

The results windows also display messages. These messages provide additional information concerning set-up and testing. A message is considered to be either persistent or non-persistent. For persistent messages, the message and result are alternately displayed, until the cause for the message is corrected. For non-persistent messages, the message is displayed once for approximately four seconds and then the result is displayed again. Refer to Appendix A for a list of the messages that are displayed and the reasons they are displayed.

2.4.2 Controls and Indicators

Control switches and display indicators are grouped according to function. Figure 2-1 illustrates the major functional control groupings, and Table 2-1 is an overview of these control switch groupings, with an explanation of the controls following that table. Figure 2-2 depicts the individual front panel controls on the INTERCEPTOR, and following that figure is a description of each control.

The following sections describe each individual control switch and the selections available for that switch. The INTERCEPTOR 1402 uses pushbutton and rocker switches. The pushbutton switch may be either a single-function or multi-function type.

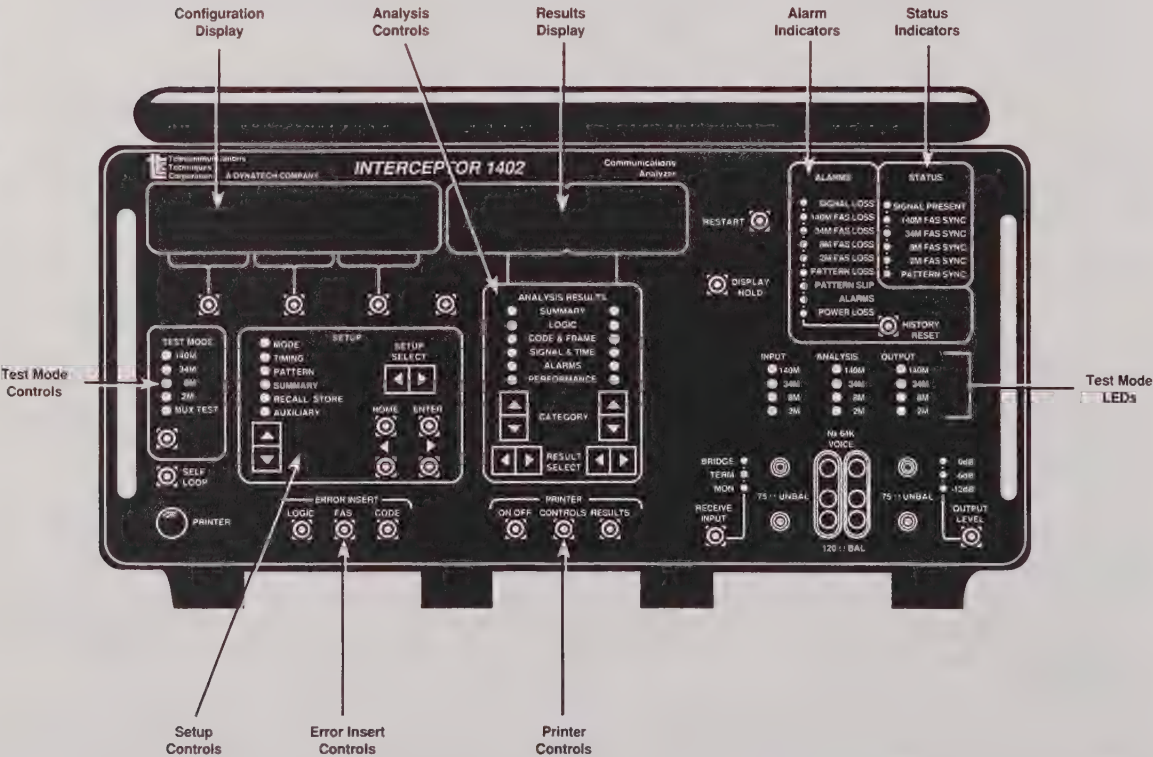


Figure 2-1
INTERCEPTOR 1402 Control and Display Groupings

A single-function pushbutton switch enables a function, disables a function, or performs an action. Examples of single function pushbutton switches are: the soft keys, **RESTART**, **DISPLAY HOLD**, **HISTORY RESET**, **HOME**, **ENTER**, **SELF LOOP**, the **ERROR INSERT** switches, and the **PRINTER** switches.

A multi-function pushbutton switch scrolls through a series of related functions. Examples of multi-function pushbutton switches are: the left and right **SETUP** switches, **TEST MODE**, **RECEIVE INPUT**, and **OUTPUT LEVEL** switches. When using a multifunction switch to scroll through a series of selections, the LED illuminated next to the front panel label indicates the choice that is selected.

Rocker switches are used to scroll through CATEGORIES, results, or menu items. Examples of rocker switches are: the **SETUP CATEGORY** switch, the **SETUP SELECT** switch, the **ANALYSIS RESULTS CATEGORY** switches, and the **ANALYSIS RESULTS RESULT SELECT** switches.

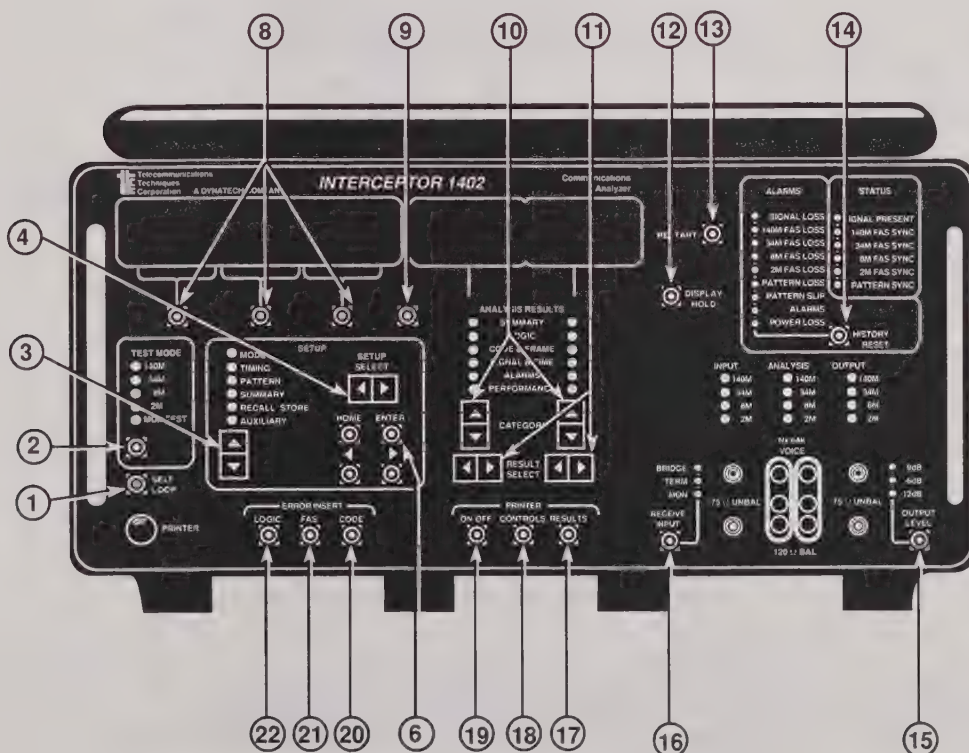


Figure 2-2
INTERCEPTOR 1402 Front Panel Controls

Table 2-1
Control Switch Functional Groupings

Switch Grouping:	Individual Switches and Their Functions:
TEST MODE	Selects the unit's test mode: 1. 2M - 2M (2.048 Mb/s) dedicated test mode 2. 8M - 8M (8.448 Mb/s) dedicated test mode 3. 34M - 34M (34.368 Mb/s) dedicated test mode 4. 140M - optional 140M (139.264 Mb/s) dedicated test mode 5. MUX TEST - multiplex operating mode
SETUP	Provides control of parameters for the selected TEST MODE.
SETUP SELECT	Used to scroll through additional menu items when the MODE, RECALL/STORE, or AUXILIARY menus are selected.
CATEGORY	Enables one of the six SETUP categories. MODE - Displays the corresponding TEST MODE related menus. Pressing the SETUP SELECT switch displays additional mode menus, determined by the selected test mode: Mux test rates (for mux/demux test only) Framing Coding 2M I/O Format (2M only) TS16 and CRC4 (2M framed only) International Bit in 2M FAS (2M framed only) 2M NFAS (2M framed only) Tributary Selection (Rx for demux only) Analysis Mode (Nx64 only) Rx/Tx Coupling (Nx64 only) Rx/Tx Timeslot (Nx64 only) Tributary Selection (Tx for mux only) TX Alarm TIMING - Displays the selected transmitter timing source. PATTERN - Displays the selected transmitter data pattern. SUMMARY - Displays the summary of the selected SETUP parameters for the selected TEST MODE. RECALL/STORE - Enables unit operating configurations to be recalled and/or stored. HOME - Returns the display to the first (home) menu of the selected category. ENTER - Confirms and saves menu item value changes.

Table 2-1
Control Switch Functional Groupings (continued)

Switch Grouping:	Individual Switches and Their Functions:
CATEGORY	ARROWS - Moves the cursor during program naming and program pattern setting. AUXILIARY - This category allows the SETUP SELECT switch to scroll through the following auxiliary categories: Monitor Gain Select Logic Error Insert Rate Frame Error Insert Rate Adjacent FAS Error Insertion Code Error Insert Rate Printer Selection/Remote Control RS-232 Baud, Data, and Parity IEEE 488 Address Printer Width and Terminator Result Print Format Timed Print Error Prints Status Prints Memory Store Memory Print Histogram Buffer Histogram Type Histogram Graph Start Histogram Graph Length Histogram Result Resync on Pattern Slip Performance Selection Lock Front Panel Site ID Restart on PowerUp Date Time Clear Memory? Language
ERROR INSERT	Inserts either single errors or multiple errors into the data at a predetermined rate. Note that for frame errors, multiple FAS errors can be inserted, depending on the Adjacent FAS ERR setting. LOGIC - Inserts bit error(s). FAS - Inserts frame error(s), if Framing is selected. CODE - Inserts code error(s), if Coding is set to HDB3 or AMI.

Table 2-1
Control Switch Functional Groupings (continued)

Switch Grouping:	Individual Switches and Their Functions:
RESULTS	Determines the ANALYSIS RESULTS category that is visible in the results display windows. CATEGORY - Enables one of the six ANALYSIS RESULTS categories. RESULT SELECT - Scrolls through the results available for any one of the following categories: (a) SUMMARY - Provides a quick overview of the ANALYSIS RESULTS categories within a single results category. Only non-zero result values are displayed for the following results: - Bit Errors - Pattern Slips - Pattern Sync Losses - Code Errors - FAS Errors - CRC Errors - REBEs - Rx Freq Δ ppm - Power Losses In addition, any active or history alarm conditions are displayed in the summary category. The alarms are listed later in this table. The Rx Frequency Δ ppm is also shown if it is outside the CCITT recommended limit. (b) LOGIC - Provides the following logic error results values: - Bit Errors - Bit Error Rate - Pattern Slips - Seconds With Slips - Pattern Synchronization Loss (c) CODE & FRAME - Provides the following code or frame result values: - Code Errors - Code Error Rate - FAS Errors - FAS Error Rate - FAS Sync Losses - CRC Errors - CRC Error Rate

Table 2-1
Control Switch Functional Groupings (continued)

Switch Grouping:	Individual Switches and Their Functions:
RESULTS	1 Second CRC Error Count CASMF Errors FAS Wd NFAS Wd MFAS Err MFER MFAS Wd REBE ABCD Signaling Bits (d) SIGNAL & TIME - Provides the following signal or time result values: Signal Losses Transmit Frequency Receive Frequency Receive Frequency Deviation (Δ ppm) Test Seconds Time Elapsed Seconds Date (e) ALARMS - Provides the status of the following alarm conditions: AIS TS16 AIS FAS Distant MFAS Distant Remote Power Losses (f) PERFORMANCE - Provides the following G.821, M.550, and performance related results values: G.821 Available Seconds Unavailable Seconds % Available Seconds Errored Seconds Error Free Seconds % Error Free Seconds Severely Errored Seconds % Severely Errored Seconds

Table 2-1
Control Switch Functional Groupings (continued)

Switch Grouping:	Individual Switches and Their Functions:
RESULTS	G.821 Degraded Minutes %Degraded Minutes Error-SES BER-SES M.550 Available Time Unavailable Time % Available Time Errored Seconds Error Free Seconds %Error Free Seconds Defect Seconds Severely Errored Seconds % Severely Errored Seconds Mean Residual Error Rate
PRINTER	Controls the printer output and type of manual print generated. ON/OFF - Turns the printer automatic output on or off. CONTROLS - Generates a controls printout. RESULTS - Generates a results printout.

Besides the display, the INTERCEPTOR front panel uses single LEDs and backlit panel labels. Discrete LEDs illuminate to indicate: the presence of additional choices (MORE) and the need to verify a newly entered value to preserve that value (ENTER); that a function is enabled (SELF LOOP, LOGIC, FAS, CODE, ON/OFF, and DISPLAY HOLD); or the current status conditions (all other LEDs).

The SETUP SELECT label is backlit when more menu items are available than the one that is visible in the display. The Nx64 and VOICE labels are respectively backlit when multiplexing and Nx64 or VOICE are selected for analysis.

2.4.3 Controls

This section provides information concerning the INTERCEPTOR controls. The number preceding each description corresponds to the number in Figure 2-2.

1. SELF LOOP

Pressing the **SELF LOOP** switch illuminates the LED inside the switch and initiates a self-loop test. The self-loop test verifies basic unit operation by internally looping the transmitter output to the receiver input. No cables need to be attached between the input and output connectors. If MUX TEST mode is selected, the Input (Rx) and Output (Tx) rates must be the same. Errors can be inserted to verify proper operation of the error insert switches, error detection circuits, and error counters.

2. TEST MODE

The **TEST MODE** switch, shown in Figure 2-3, selects the data rate at which the INTERCEPTOR is to operate. Repeatedly pressing this switch cycles through the available test modes (MUX TEST, 2M, 8M, 34M, and optionally 140M). The selected test mode is indicated by the LED illuminated next to the label. The **TEST MODE** selection determines what is displayed when the MODE SETUP CATEGORY is selected, as well as the availability of other configuration choices.

2M - Selects the dedicated 2M test mode, which provides the capability to receive, analyze, and transmit data at the 2M (2.048 Mb/s) data rate.

8M - Selects the dedicated 8M test mode, which provides the capability to analyze data, coding, and framing at the 8M (8.448 Mb/s) data rate.

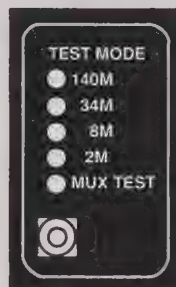


Figure 2-3
TEST MODE Switch

34M - Selects the dedicated 34M test mode, which provides the capability to analyze data, coding, and framing at the 34M (34.386 Mb/s) data rate.

140M (Optional) - Selects the dedicated 140M test mode, which provides the capability to analyze data, coding, and framing at the 140M (139.264 Mb/s) data rate. If the 140M option is not installed, this LED does not illuminate.

MUX TEST - Selects the mux/demux test mode, which provides the capability to analyze data, coding, and framing at different data rates. This allows the operator to select one input rate, a different analysis rate, and another output rate. The selected analysis rate must be equal to or less than the input or output data rate for the mux/demux configuration to be valid. For more details about the mux/demux operating configuration, refer to the **MODE** category explanation later in this Section.

3. CATEGORY

This rocker switch is one of six **SETUP** switches used to display and control the unit operating configuration for the selected **TEST MODE**. Figure 2-4 illustrates the **SETUP** switches. Pressing the **CATEGORY** switch scrolls through the setup categories: **MODE**, **TIMING**, **PATTERN**, **SUMMARY**, **RECALL/STORE**, and **AUXILIARY**. Pressing either the up or down arrow on this switch scrolls through the categories in the corresponding direction.

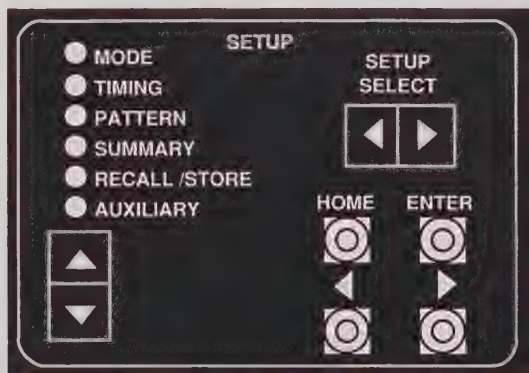


Figure 2-4
SETUP Switches

MODE - This **SETUP** category displays the selected test mode data rate. Pressing the **SETUP SELECT** switch displays the other parameters used (e.g., framing and coding) when analyzing data for the selected **TEST MODE** operation. When the **TEST MODE** switch is not set to **MUX TEST**, the mode is considered to be dedicated. Dedicated testing implies that the input, analysis, and output data rate (2M, 8M, 34M, and optionally at 140M) are the same. However, when the **TEST MODE** switch is set to **MUX TEST**, the receive, analysis, and output data rates may each be a different data rate. Additional time is required when switching between the different rates using the **TEST** mode switch; this time is necessary to re-initialize the instrument for the selected data rate. The following subsections describe the dedicated test modes.

Dedicated Test Modes:

2M test mode - Provides the capability to receive, analyze, and transmit data at the 2M (2.048 Mb/s) data rate. Figure 2-13 illustrates the 2M mode menus. In 2M test mode, the coding and framing parameters can be viewed and selected.

If Framed is selected, view two additional parameters, TS16 (timeslot 16) and CRC4 (cyclic redundancy check 4), by pressing the right **SETUP SELECT** switch.

The parameters that can be configured for 2M Coding are:

Framing: Framed or Unfram
 TS16: On or Off*
 CRC4: On or Off*
 2M Coding: HDB3, AMI, RZ, or NRZ
 2M I/O Format: 75Ω or 120Ω
 Int'l Bit in 2M FAS: 0 or 1*†
 2M FAS: 11a11111*
 Tx Alarm: 2M AIS: On or Off
 FAS DIS: On or Off
 MFAS Dis: On or Off

Framing Selections - Framing (Framed or Unfram) is selected according to the framing status of the received data. With Framed selected, two additional menu item selections, TS16 and CRC4, can be controlled (enabled or disabled). Pressing the right arrow on the **SETUP SELECT** switch displays the present status for the TS16 and CRC4 selections. Pressing the soft key below the selection (TS16 or CRC4) in the display window toggles that item On to Off or Off to On.

TS16 - Turning TS16 on allows the multiframe synchronization and multiframe alarms (TS16 AIS and MFAS Distant) to be monitored. The LED labeled 2M FAS SYNC is used in this operating mode and illuminates when both FAS synchronization and MFAS synchronization are achieved.

CRC4 - Cyclic Redundancy Check 4 uses bit 1 from each of the 16 frames in a multiframe to send CRCs to check the integrity of the transmission.

2M I/O Format - This selection is available when 2M is selected for the input or output data rate. The I/O format section allows the 2 Mb/s signal to be enhanced for the transmission used. When 2 Mb/s is being received, cable equalization is optimized and when 2 Mb/s is being transmitted, the line build-out (LBO) is slightly modified for the selected medium. Menu item selections are **75Ω** or **120Ω**.

75Ω - Indicates that the 2M transmission medium is coaxial cable. This selection automatically adjusts the signal for the resistive loss that is experienced when coaxial cables are used.

120Ω - Indicates that the 2M transmission medium is twisted pairs. This selection automatically adjusts the signal for the reactive loss that is experienced when twisted pairs are used.

Coding Selections - There are several methods for encoding digital data into electrical signals, suitable for transmission. This selection tells the INTERCEPTOR what type of coding it should expect to receive and transmit. Figure 2-6 depicts the schemes for encoding digital data.

* Displayed only when **Framed** is selected.

† CRC must be set Off for this menu to be displayed.

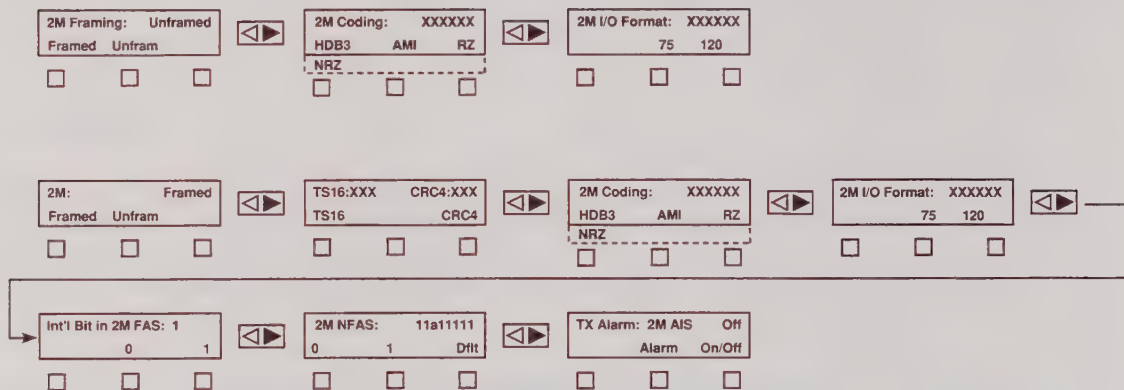


Figure 2-5
2M Mode Menus

HDB3 or AMI coding is selected for signals present at the front panel connectors, while RZ or NRZ coding is selected for signals present at the side panel BNC connectors. When RZ or NRZ coding is selected, the front panel LEDs for the RECEIVE INPUT and OUTPUT LEVEL are extinguished to indicate that the signal must be connected to the side panel.

HDB3 - High Density Bipolar 3 coding is a pseudoternary code, having three states (positive pulse, negative pulse, and zero). A binary space is coded as a space in HDB3 and binary pulses are coded as alternating positive and negative pulses. HDB3 adheres to the Alternate Mark Inversion (AMI) coding scheme, but purposely violates the AMI rule when a series of four spaces are encountered. CCITT Recommendation G.703 defines the rules for HDB3 coding. An example of HDB3 coding is illustrated in Figure 2-6.

AMI - Alternate Mark Inversion is a pseudoternary code, having three states (positive pulse, negative pulse, and zero). A binary space is coded as a space and binary pulses are coded as alternating positive and negative pulses. An example of AMI coding is illustrated in Figure 2-6.

RZ - Return to Zero is a 50% duty cycle digital coding, having two states for each pulse state. Figure 2-6 illustrates an RZ signal.

NRZ - Non-Return to Zero is a 100% duty cycle digital coding, having one state for each pulse state. Figure 2-6 illustrates a NRZ signal.

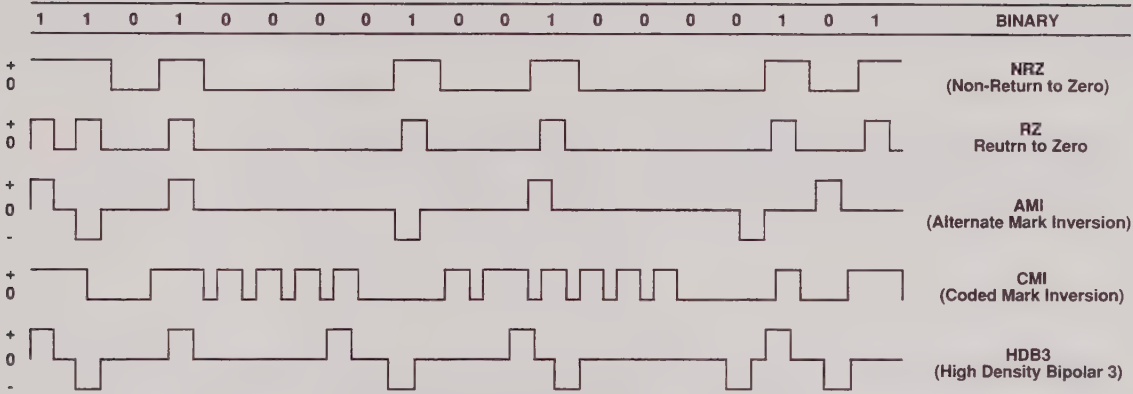


Figure 2-6
Digital Coding Schemes

8M test mode - Provides the capability to analyze data, coding, framing, and transmission alarms at the 8M (8.448 Mb/s) data rate. Figure 2-7 illustrates the 8M mode menus. In 8M test mode, select the coding, framing, and transmission alarm parameters by pressing the soft key located below the desired menu item. Menu selections are as follows:

- Framing: Framed or Unframed
8M Coding: HDB3, AMI, RZ, or NRZ
Tx Alarm: 8M AIS: On or Off
8 Remote: On or Off

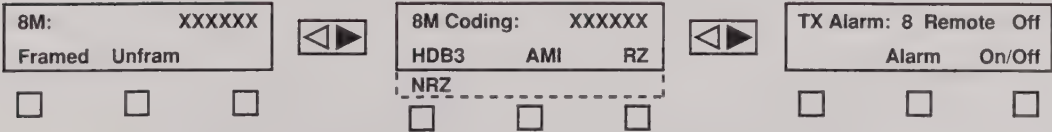


Figure 2-7
8M Mode Menus

34M test mode - Provides the capability to analyze data, coding, framing, and transmission alarms at the 34M (34.386 Mb/s) data rate. Figure 2-8 illustrates the 34M mode menus. In 34M test mode, select the coding, framing, and transmission alarm parameters by pressing the soft key located below the desired menu item. Menu selections are as follows:

- Framing: Framed or Unframed
- 34M Coding: HDB3, AMI, RZ, or NRZ
- Tx Alarm: 34M AIS: On or Off
- 34 Remote: On or Off

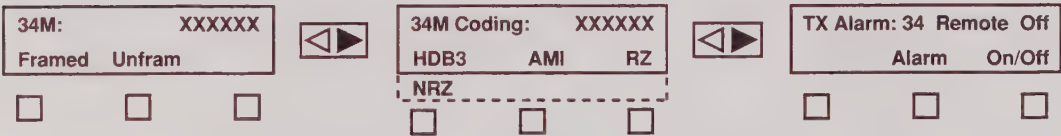


Figure 2-8
34M Mode Menus

140M test mode (Optional) - Provides the capability to analyze data, coding, framing, and transmission alarms at the 140M (139.264 Mb/s) data rate. Figure 2-9 illustrates the 140M mode menus. In 140M test mode, select the coding, framing, and transmission alarm parameters by pressing the soft key located below the desired menu item. Menu selections are as follows:

- Framing: Framed or Unframed
- 140M Coding: CMI or RZ
- Tx Alarm: 140M AIS: On or Off
- 140 Remote: On or Off

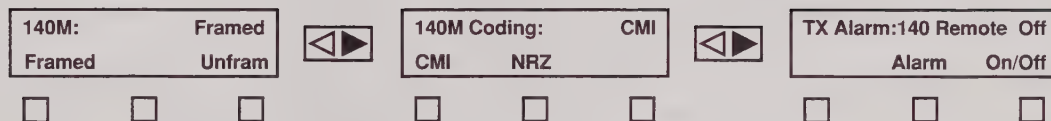


Figure 2-9
Optional 140M Mode Menus

MUX TEST - Selects the multiplex/demultiplex test mode. Mux/demux provides the capability to analyze data, coding, and framing at different rates. This permits the operator to select one input data rate, analyze data at another data rate, and select another data rate for the output rate. Perform multiplexing by going from a lower input (Rx) data rate to a higher output (Tx) data rate. Perform demultiplexing by going from a higher input (Rx) data rate to a lower output (Tx) data rate. When multiplexing/demultiplexing, the selected analysis rate can be equal to but cannot be greater than either the input or output data rate.

The Mux Test mode displays the selected Rx (receive), An (analysis), and Tx (transmit) frequencies. Figure 2-10 illustrates the mux mode menus. The soft keys below the **Rx**, **An**, and **Tx** values in the display are used to change the corresponding value.

For example, pressing the soft key below the **Rx** value displays the next available data rate. In addition to the data rates available for the **Rx** and **An** menu selections, the **Tx** menu item selections include 2MRx and =Rx. The 2MRx selection allows 2 Mb/s live data to be output to another test instrument. The =Rx selection automatically configures the transmitter to match the tributaries and frequency of the receiver. Figure 2-10 depicts the available menus when Tx=Rx. Changing any of the three data rates requires the operator to press the **ENTER** switch to confirm the new value before another category or menu can be displayed. The LED in the **ENTER** switch illuminates when any MUX data rate is changed, indicating that the ENTER switch must be pressed for the change to be implemented.

NOTE: For valid MUX TEST frequency selection, the analysis frequency must be equal to or less than the lower of the input (Rx) or output (Tx) frequency selections. And, when performing a MUX self-loop test, the input (Rx) and output (Tx) rates must be the same, or the message **INVALID RCV FREQUENCY** is displayed in the results window.

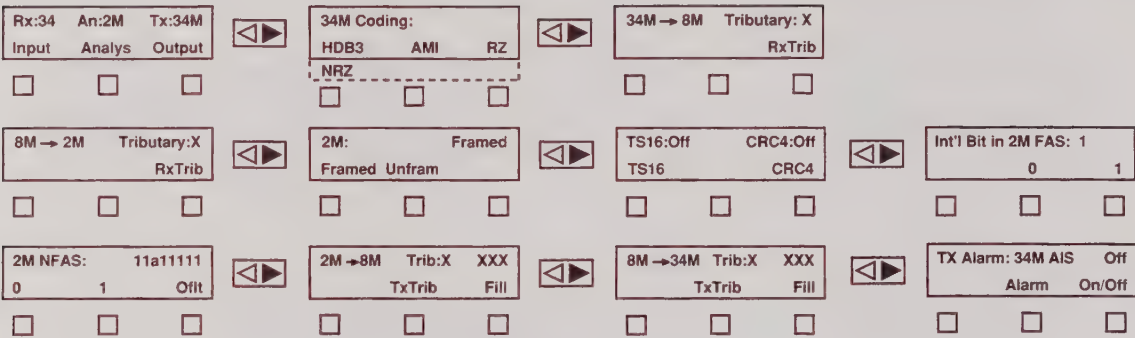


Figure 2-10
Mux Menus available when Tx=Rx

If the new selections are not allowed, the message **INVALID SETUP** is visible in the display and the last valid set-up is returned. The selected input, analysis, and output data rates can be quickly viewed by observing the LED illuminated in the column below the INPUT, ANALYSIS, and OUTPUT labels, located on the right side of the front panel. The selected data rate for each item is indicated by the LED that is illuminated in each column.

The analysis rate is the data rate at which bit error analysis is performed. The selected analysis rate is typically a tributary from a higher data rate. With the Nx64 option installed, an individual timeslot or several timeslots can be selected for analysis. Logic errors can be inserted at the analysis rate and analysis results can be obtained from the selected analysis rate.

When performing a mux/demux operation from one data rate to another, the desired tributary must be selected. For example, if the mux/demux setup is 8M for the input, 2M for the analysis, and 8M for the output rate; the Rx tributary must be specified for the 8M → 2M demultiplex conversion and also for the 2M → 8M Tx multiplexing conversion.

Input Tributary Selection - Pressing the right **SETUP SELECT** switch displays the input tributary selection on the top line and the label “Rx Trib” on the bottom line. Pressing the soft key below the Rx Trib label increments the received tributary selection to the next selection. Rx Trib selections are 1, 2, 3, or 4.

The Rx Trib selection is used to select one of the four tributaries from a higher data rate from which the data is to be taken. Demultiplexing allows a portion of a higher data rate to be removed for analysis, while ignoring the remaining three tributaries. This allows the user to test a data link while some of its tributaries still carry live data.

Output Tributary Selection - Pressing the right **SETUP SELECT** switch once more displays the output tributary selection on the top line and the label “Tx Trib” on the bottom line. Pressing the soft key below the Tx Trib label advances the received tributary selection to the next selection. Tx Trib selections are 1, 2, 3, 4, or All.

Use the Tx Trib selection to select into which (of the four tributaries) to insert output data. If All is selected, the transmit signal will be composed of 4 tributaries, all of which contain the test pattern. If one of the single tributaries is selected, the transmitted signal is composed of one tributary containing the test pattern and three other tributaries containing a fill pattern.

The Fill data pattern selection determines the type of pattern that is inserted into the unused tributary. Fill data patterns are:

All 1's - Transmits all ones in the unused tributaries.

Rnd (random) - Transmits random data in the unused tributaries.

As shown in Figure 2-9, the third menu is the TX140M AIS (Alarm Indication Signal) menu. The soft key below the **On/Off** menu item determines whether the 140 Mb/s AIS signal is transmitted or not. When set to On, the 140M AIS is transmitted and no other alarm menus are available. Setting 140M AIS to Off halts transmission the 140M AIS alarm and makes the other alarm menu choices available.

Pressing the soft key below the **Alarm** menu item displays the next alarm. Repeatedly pressing this soft key displays the status of the available AIS, remote, and distant alarm menus. If the 2M menu is set to **Framed** or if Nx64 analysis is selected and the TS16 menu item is set to **On**, then the MFAS Dis alarm menu may be displayed. If **Framed** is not selected or if TS16 is set to **Off**, then the MFAS Dis menu is not displayed.

Pressing the right arrow on the **SETUP SELECT** switch displays the transmitted alarm status. Since the transmitted data rate is 140 Mb/s, the TX140M AIS menu status is the first alarm menu displayed. Pressing the soft key below the **On/Off** menu item toggles the TX140M AIS menu. Pressing the soft key below the **Alarm** menu item displays the alarm menus in this order:

TX140M AIS Off
TX34M AIS Off
TX8M AIS Off
TX2M AIS Off
140Remote Off
34Remote Off
8Remote Off
FAS Distant Off
MFAS Dis Off*

* Only displayed if the 2M menu is set to **Framed** or analysis is set to Nx64 and the TS16 menu is set to On.

Instrument Description

Pressing the soft key below the **Input**, **Analys**, and **Output** labels scrolls through the available choices. The following list indicates the choices available for each menu item:

Input	Analys	Output
140M*	140M*	140M*
34M	34M	34M
8M	8M	8M
2M	2M	2MRx
	Nx64†	2M
		=Rx

Changing any of the mux/demux data rates illuminates the LED in the **ENTER** switch. Pressing the **ENTER** switch indicates that the displayed data rates are correct and extinguishes the LED in this switch. If the **SETUP SELECT** rocker switch is pressed, the following message is visible in the display window:

<ENTER> CHANGES?
Yes No

Pressing the soft key below the corresponding response either enters the new values or defaults to the last valid data rate selections. The **ENTER** switch can also save the new mux/demux data rates.

If the selected analysis rate is greater than the input or output rate, the following message is visible in the display window for approximately four seconds:

INVALID SETUP

The invalid set-up is not saved, and the last valid data rates are again visible in the display.

When the **SELF LOOP** switch is pressed and the MUX TEST mode is selected, the Rx (input) and Tx (output) data rates must be the same. If these data rates are not the same, the following message is visible in the results window:

INVALID RCV FREQUENCY

Once the self-loop mode is disabled, the Tx and Rx data rates can once again be set to different data rates.

The mux/demux menus displayed are determined by the input, analysis, and output data rates selected. The menu choices determine what additional menus are displayed. Figure 2-11 depicts the menu items and choices available for the selected mux/demux configuration.

* Requires the 140M option to be installed.

† Requires the Nx64 option to be installed.

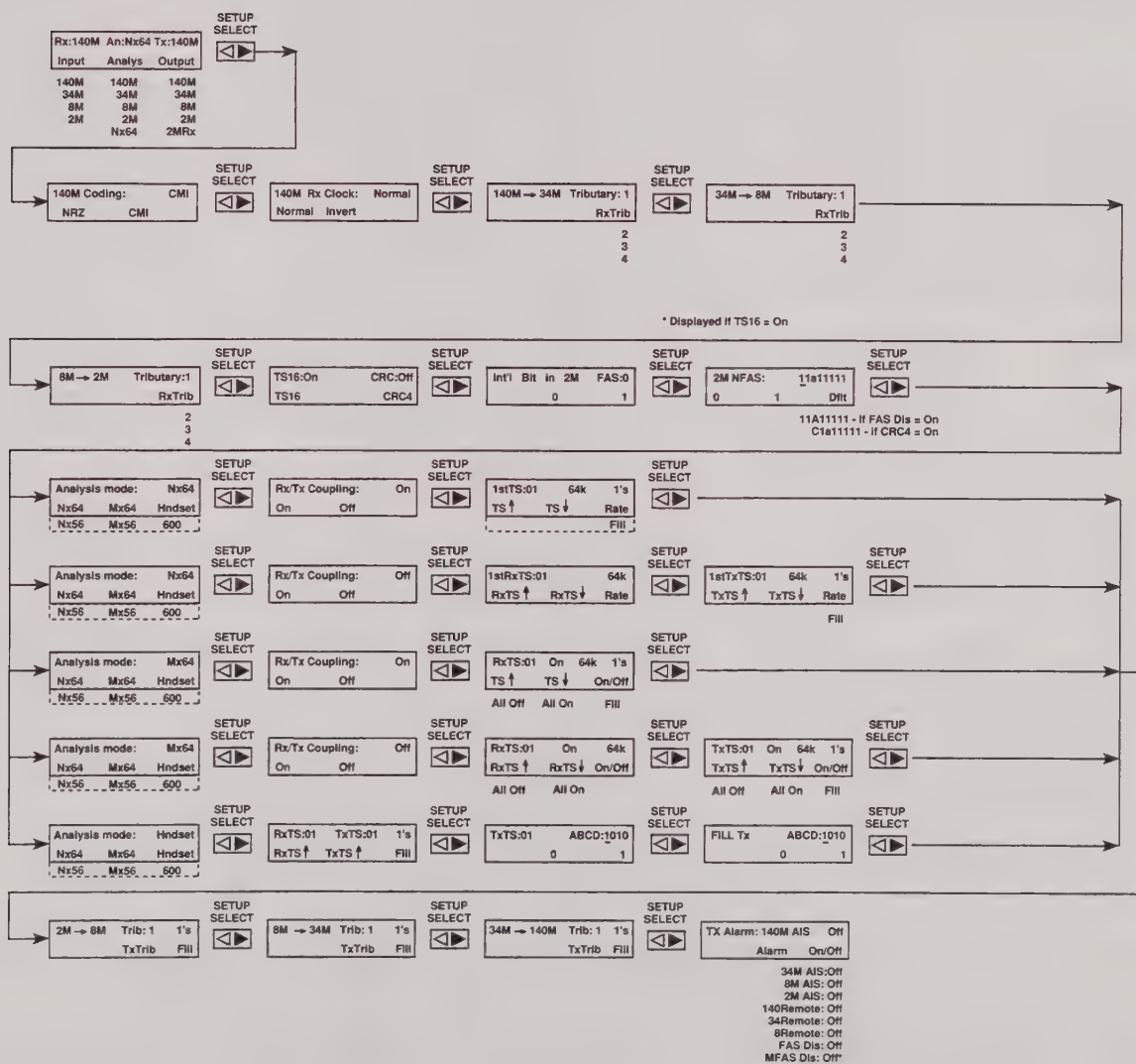


Figure 2-11
Mux/Demux Menu for 140M-Nx64-140M Configuration

NOTE: these are options

Instrument Description

Input - pressing the soft key below this menu item displays the next available Rx (receive) data rate. Input data rate choices are: 140M, 34M, 8M, and 2M.

NOTE: The 140M menu choice is only available if the 140M option is installed.

Analys - pressing the soft key below this menu item displays the next available analysis data rate. Analysis data rate choices are: 140M, 34M, 8M, 2M, and Nx64.

NOTE: The 140M and Nx64 menu choices are only available if the 140M and Nx64 options are installed.

Output - pressing the soft key below this menu item displays the next available Tx (output) data rate. Output data rate choices are: 140M, 34M, 8M, 2MRx, 2M, and =Rx.

NOTE: The 140M menu choice is only available if the 140M option is installed. Choosing **2MRx** allows 2M bit/s live data to be output to another test instrument for further analysis. To do this, the TIMING category must be set to **Rec** (recovered). Choosing **=Rx** will automatically configure the transmitter to match the settings of the receiver. When using the **=Rx** selection, all transmitter selections are automatically set to make selection simpler for the user. As this mode is intended to simplify monitor applications, it inhibits most transmit selections.

Pressing the **SETUP SELECT** switch allows the mux/demux menus to be viewed. Refer to Figure 2-11 during the following discussion. Remember that the displayed menus are determined by the mux/demux data rate selections. Menu item selections also determine what menus are displayed, along with the menu selections available.

Figure 2-11 illustrates a typical mux/demux menu when the input data rate is 140 Mb/s, the analysis rate is Nx64 Mb/s, and the output data rate is 140 Mb/s. This mux/demux configuration displays the greatest number of menus for an INTERCEPTOR 1402 with all available options.

The Rx:140M An:Nx64 Tx:140M menu displays the input, analysis, and output data rates. Pressing the soft key below the **Input**, **Analys**, and **Output** menu items scrolls through the available data rate selections.

Pressing the right arrow on the **SETUP SELECT** switch displays the 140M Coding menu and the selected input coding. The input coding menu determines the type of coding to which the INTERCEPTOR expects the incoming data to conform.

Pressing the right arrow on the **SETUP SELECT** switch displays the 140M→34M receive tributary menu. This receive tributary menu indicates which 34 Mb/s tributary (1, 2, 3, or 4) is selected from the optional 140 Mb/s data rate.

Pressing the right arrow on the **SETUP SELECT** switch displays the 34M→8M receive tributary menu. This receive tributary menu indicates which 8 Mb/s tributary (1, 2, 3, or 4) is selected from the 34 Mb/s data rate.

Pressing the right arrow on the **SETUP SELECT** switch displays the 8M→2M receive tributary menu. This receive tributary menu indicates which 2 Mb/s tributary (1, 2, 3, or 4) is selected from the 8 Mb/s data rate.

Pressing the right arrow on the **SETUP SELECT** switch displays the TS16 and CRC4 menu and their status on the top line. The bottom line displays TS16 and CRC4. Pressing the soft key below these menu items toggles the associated menu item to its opposite state.

If the CRC4 menu item is Off, then pressing the right arrow on the **SETUP SELECT** switch displays the 2M FAS international bit menu. Pressing the soft key below the **0** or **1** menu item sets the national bit in the 2M FAS accordingly. However, if the CRC menu item is set to On, then this menu is not displayed.

Pressing the right arrow on the **SETUP SELECT** switch displays the 2M NFAS byte. The current 2M NFAS byte value is displayed on the top line. A flashing cursor is displayed under the left-most bit position. Pressing the soft key below the **0** or **1** menu choice, on the bottom line, sets the bit value at the cursor position to that value. Use the left- or right-arrow key to move the cursor position. Pressing the soft key below the default (**Dflt**) menu choice sets the 2M NFAS value to 11a11111. The 2M NFAS byte changes, depending on the Tx Alarm menu and CRC4 menu selections. The third bit from the left represents the FAS Distant alarm bit. When the alarm is present, the INTERCEPTOR 1402 displays an uppercase **A**. If the alarm is not present, the display shows this bit set to a lower case **a**. Likewise, bit 1 represents the CRC bit, whenever CRC encoding is detected the INTERCEPTOR 1402 shows a **C** in bit 1. If FAS Dis is set to On, then 2M NFAS is 11A11111. If CRC4 is On, then the 2M NFAS is C1a11111.

Figure 2-12 depicts the 2M NFAS byte Selection Menu.

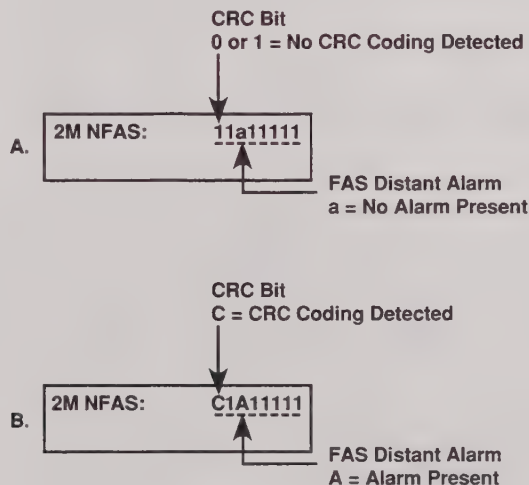


Figure 2-12
2M NFAS Byte and Default Menu Choices

The following setup descriptions apply to the Nx64k option for the INTERCEPTOR 1402. Turn to the next section if your unit does not have this option.

Pressing the right arrow on the **SETUP SELECT** switch displays the ANALYSIS mode menu. The selected analysis mode is displayed on the top line and the first three menu choices (**Nx64**, **Mx64**, and **Handset**) are displayed on the bottom line. The LED in the **MORE** switch is illuminated indicating that more analysis choices are available. Pressing the **MORE** switch displays the next three menu choices: **Nx56**, **Mx56**, and **600Ω**. The next displayed menu is determined by the Analysis mode menu selection. Figure 2-13 illustrates the different analysis mode menus available for the different analysis/coupling menu choices.

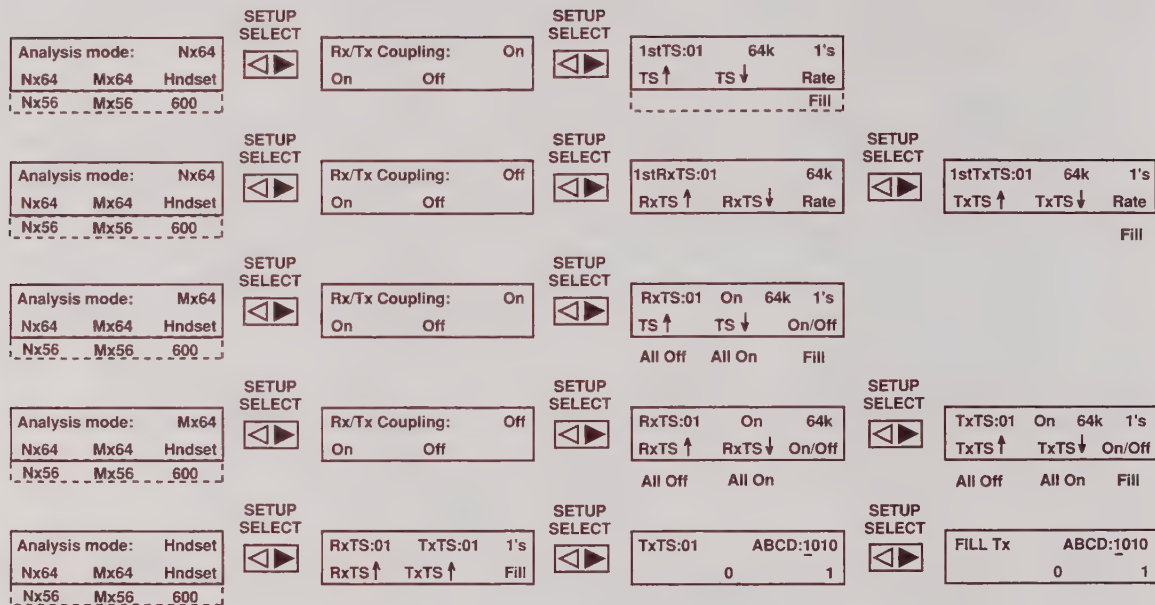


Figure 2-13
Analysis Mode and Coupling Menu Selection Combinations

The ANALYSIS mode selection determines the menus that are displayed when the right arrow on the **SETUP SELECT** switch is pressed. The ANALYSIS mode menu selections are:

- Nx64 - Contiguous 64 kb/s timeslots.
- Mx64 - Non-contiguous 64 kb/s timeslots.
- Hndset - Handset operation supported.
- Nx56 - Contiguous 56 kb/s timeslots.
- Mx56 - Non-contiguous 56 kb/s timeslots.
- 600Ω - External tone generator operation supported.

The Rx/Tx TS Coupling menu determines whether the same receive (Rx) and transmit (Tx) timeslots are selected. The Rx/Tx Coupling selection can be set to On or Off. Selecting **On** couples the receive timeslot(s) with the transmit timeslot(s) and allows the available timeslots to be turned on or off. However, selecting **Off** allows receive and transmit timeslot selections to be made independently of each other. With **Off** selected, the number of receive timeslots can be different from the transmit timeslots.

Pressing the right arrow on the **SETUP SELECT** switch displays the first analysis menu. As can be seen in Figure 2-13, the analysis mode and coupling menu selections determine the first analysis menu displayed. The following paragraphs describe the Analysis menu item selections.

Nx64 - This menu selection supports contiguous 64 kb/s timeslot operation. Choosing Nx64 allows the user to select a series of contiguous timeslots. With Rx/Tx Coupling set to On, the menu shown in Figure 2-14 is visible in the display window. The 1stTS indicates the first selected timeslot. The value on the top line (0k to 1984k) indicates how many contiguous timeslots are selected. Pressing the soft key below the Rate menu item selects an additional timeslot and increments the displayed rate by 64k. The maximum rate allowed is determined by the first selected timeslot (01 to 31) and the TS16 menu item selection (On or Off). If the 1stTS is 01 and TS16 is On, the maximum rate is 1920k, but if the 1stTS is 01 and TS16 is Off, the maximum rate is 1984k. Each time the 1stTS is incremented from 01, the maximum rate (1984k or 1920k) is decreased by 64k.

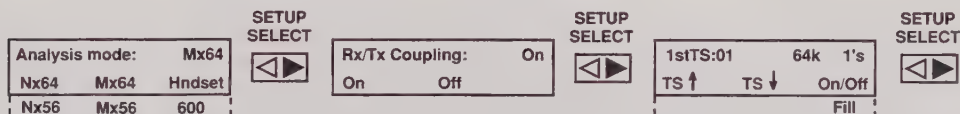


Figure 2-14
Nx64 Menu Selections with Rx/Tx Coupling On

With the Rx/Tx Coupling menu set to Off, the menu shown in Figure 2-15 is visible in the display window. The 1stRxTS indicates the first selected receive timeslot and the rate (0k to 1984k) indicates the number of contiguous timeslots selected. Repeatedly pressing the soft key below the **Rate** menu item increments the rate to its maximum value and then cycles through 0k. The soft key below the **RxTS** and **TxTS** keys are used to select the first receive timeslot. After selecting the first receive timeslot and the number of timeslots by using the Rate soft key, pressing the right **SETUP SELECT** switch displays the 1stTxTS menu. The soft key below the **RxTS** and **TxTS** menu items increments or decrements the first transmit timeslot. The soft key below the **Rate** menu item increments number of consecutive timeslots by one (64k) each time it is pressed. Pressing the MORE soft key displays the **Fill** menu item. The Fill menu selection determines the pattern (1's or IDLE) that is inserted on the unselected transmit timeslots. Pressing the soft key below the **Fill** menu item toggles the selection between 1's and IDLE. Selecting 1's inserts all 1's into the selected transmit timeslot. Selecting the **IDLE** menu item allows the user to enter an 8-bit byte of their choosing by pressing the soft key below the 0 or 1 menu item for the current cursor position.



Figure 2-15
Nx64 Menu Selections with Rx/Tx Coupling Off

Mx64 - This menu selection supports non-contiguous 64 kb/s timeslot operation. Non-contiguous 64k operation allows any combination of timeslots to be selected. With Rx/Tx Coupling set to **On**, the menu shown in Figure 2-16 is visible in the display window. The soft keys below the **RxTS** and **RxTS** menu items are used to scroll through the timeslots. Pressing the soft key below the **On/Off** menu item toggles the displayed timeslot between On and Off. Pressing the **MORE** soft key displays the **AllOff**, **AllOn**, and **Fill** menu selections. Pressing the soft key below the **AllOff** menu item turns off all of the timeslots and pressing the soft key below the **AllOn** menu item turns on all of the timeslots. The Fill menu selection determines the pattern (1's or IDLE) that is inserted on the unselected timeslots. Pressing the soft key below the **Fill** menu item toggles the selection between 1's and IDLE. Selecting 1's inserts all 1's into the unselected transmit timeslots. Selecting the IDLE menu item allows the user to enter an 8-bit byte of their choosing by pressing the soft key below the 0 or 1 menu item for the current cursor position.

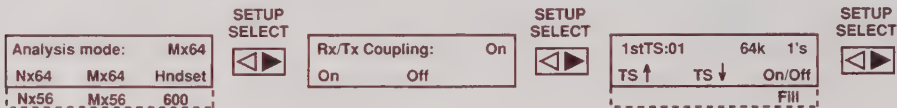


Figure 2-16
Mx64 Menu Selections with Rx/Tx Coupling On

Each timeslot that is turned ON increments the displayed rate (0k to 1984k) by 64k up to its maximum value. The maximum value is either 1920k or 1984k, depending on whether TS16 is turned on or off respectively.

With the Rx/Tx Coupling menu set to Off, the menu shown in Figure 2-17 is visible in the display window. The RxTS value indicates the first selected receive timeslot and the rate (0k to 1984k) indicates the number of timeslots that are enabled (On). Repeatedly pressing the soft key below the **On/Off** menu item toggles the displayed receive timeslot between on and off. When set to on, the displayed rate increases by a value of 64k. The soft key below the **TS** and **TS** keys is used to select the desired receive timeslot. After selecting the desired receive timeslot, press the soft key below the **On/Off** menu item to enable (On) or disable (Off) the displayed timeslot, pressing the right **SETUP SELECT** switch displays the TxTS menu. The soft key below the TxTS and TxTS menu items increments or decrements the displayed transmit timeslot. The soft key below the On/Off menu item enables or disabled the displayed transmit timeslot and changes the rate by 64k each time a timeslot is enabled or disabled.



Figure 2-17
Mx64 Menu Selections with Rx/Tx Coupling Off

Pressing the MORE soft key displays the **Alloff**, **AllOn**, and **Fill** menu items. Pressing the soft key below the **Alloff** menu item turns off all of the transmit timeslots and decreases the rate to 0k. Pressing the soft key below the **AllOn** menu item turns on all of the transmit timeslots and increases the rate to its maximum value (either 1920k or 1984k). The **Fill** menu selection determines the pattern (1's or IDLE) that is inserted on the unselected transmit timeslots. Pressing the soft key below the **Fill** menu item toggles the selection between 1's and IDLE. Selecting 1's inserts all 1's into the unused transmit timeslots. Selecting the **IDLE** menu item transmits a fixed 8-bit value in all unused timeslots.

If the Nx64 option was configured for **IDLE** as the fill pattern, pressing the right arrow on the **SETUP SELECT** switch displays the Idle Code menu. Pressing the soft key below the **0** and **1** menu items on the bottom line sets the bit at the cursor position to the corresponding value (0 or 1). Pressing the **ENTER** switch sets the idle code to the newly entered value.

Hndset - This menu selection supports operation of an external handset plugged into the side panel 4-pin modular connector. This supports a voice connection over the selected timeslot(s). The soft keys below the **RxTS** and **TxTS** menu items allow the selection of the same timeslot or different timeslots. Each time the **RxTS** or **TxTS** soft key is pressed, the displayed timeslot value increments. Figure 2-18 illustrates the handset menu. The **Fill** menu selection determines the pattern (1's or IDLE) that is inserted on the unused transmit timeslots. Pressing the soft key below the **Fill** menu item toggles the selection between 1's and IDLE. Selecting 1's inserts all 1's into all but the selected transmit timeslots, except for the one which is set to transmit the voice, that set the **VOICE** from the handset. Selecting the **IDLE** menu item transmits a fixed 8-bit value in all unused timeslots.

Pressing the right arrow on the **SETUP SELECT** switch displays the Idle Code menu. Pressing the soft key below the **0** and **1** menu items on the bottom line sets the bit at the cursor position to the corresponding value (0 or 1). Pressing the **ENTER** switch sets the idle code to the newly entered value.



Figure 2-18
Handset Menu Selections with TS16 Off

If TS16 is set On, Figure 2-19 illustrates the transmit timeslot selection and signalling bit status. Pressing the soft key below the **0** or **1** menu item maintains or changes the signalling bits binary value at the current cursor position and moves the cursor to the next bit position. Once the last bit value is set, the cursor cycles back to the first bit position again.



Figure 2-19
Handset Menu Selections with TS16 On

Nx56 - This menu selection supports contiguous 56 kb/s timeslot operation. Nx56 operation is identical to the Nx64 operation already described, with the exception that rate increments are in 56k steps instead of 64k steps. This results in a maximum rate of 1680k if TS16 is On or 1736k if TS16 is Off.

Mx56 - This menu selection supports non-contiguous 56 kb/s timeslot operation. Mx56 operation is identical to the Mx64 operation already described, with the exception that rate increments are in 56k steps instead of 64k steps. This results in a maximum rate of 1680k if TS16 is On or 1736k if TS16 is Off.

600Ω - This menu selection supports connection of a voice frequency signal to the side panel 3-prong connector. This permits an external tone generator to be used to inject a voice frequency tone into the selected timeslot(s). Other than the connector used, the 600Ω operation and menus displayed are the same as for the handset mode of operation that has already been described.

Pressing the right arrow on the **SETUP SELECT** switch displays the 2M→8M Trib menu. This menu displays the tributary that the 2M signal is inserted into the 8M data rate. Pressing the soft key below the **TxTrib** scrolls to the next tributary value. Transmission tributary selections are: 1, 2, 3, 4, or All. Pressing the soft key below the **Fill** soft key determines the fill pattern inserted into the other three 2M tributaries. Fill pattern selections are **Rnd** or **IDLE**.

Rnd - fills the non-selected tributaries with a random pattern of 1's and 0's.

IDLE - fills the non-selected tributaries with the user-defined idle channel pattern.

Pressing the right arrow on the **SETUP SELECT** switch displays the 8M→34M Trib menu. This menu displays the tributary that the 8M signal is inserted into the 34M data rate. The **TxTrib** and **Fill** menu item choices for this menu are the same as for the 2M→8M Trib menu.

Pressing the right arrow on the **SETUP SELECT** switch displays the Rx:34M An:2M Tx:34 menu again.

TIMING - Selecting this category displays the selected timing source used for data transmission. Figure 2-19 illustrates the Timing Menu. Transmitter timing source selections are

REC - Uses the recovered timing from the received data as the transmitter timing source.

INT - Uses the internal crystal oscillator as the transmitter timing source.

EXT - Uses the external clock, inserted at the side panel connector, as the transmitter timing source.

Tx Timing: Internal		
Int	Ext	Rec

Figure 2-20
Timing Menu Display

PATTERN - This category displays the selected data pattern that is inserted at the specified analysis rate on the transmitted data. Figure 2-21 illustrates the pattern menu display. Transmission pattern selections are considered to be either fixed (MARK, SPACE, 1:3, or 1:4) or pseudorandom (2^6-1 , 2^9-1 , $2^{11}-1$, $2^{15}-1$, $2^{20}-1$, or $2^{23}-1$). A description of the available patterns is contained in Table 2-2.

Pattern: 2^15-1		
Mark	Space	1:1
1:3	1:4	2^6-1
2^9-1	2^11-1	2^15-1
2^20-1	2^23-1	Progrm

MORE ☐

Figure 2-21
Pattern Menu Display

Table 2-2
Pattern Descriptions

Pattern:	Description:
MARK	Provides a fixed Mark only (all ones) test pattern. This pattern, which must be unframed, is used as a keep-alive, idle, or Alarm Indication Signal (AIS) in some circuits.
SPACE	Provides a fixed Space only (all zeros) test pattern. This pattern is used instead of the Mark pattern when an inverted data pattern is required.

Table 2-2
Pattern Descriptions (continued)

Pattern:	Description:
1:1	Provides a fixed pattern of a Mark alternating with a Space. This pattern is used to perform a minimum-level stress test on clock recovery circuits.
1:3	Provides a fixed pattern of one Mark followed by three Spaces. This pattern ensures that there are no HDB3 sequences.
1:4	Provides a fixed pattern of one Mark followed by four Spaces. This pattern guarantees HDB3 sequences.
2^6 -1	This 63-bit pseudorandom pattern generates a maximum of 5 sequential zeros and 6 sequential ones.
2^9 -1	This 511-bit pseudorandom pattern generates a maximum of 8 sequential zeros and 9 sequential ones (CCITT V.52).
2^11 - 1	This 2047-bit pseudorandom pattern generates a maximum of 10 sequential zeros and 11 sequential ones (CCITT O.152).
2^15 -1	This 32,767-bit pseudorandom pattern generates a maximum of 14 sequential zeros and 15 sequential ones (CCITT O.151).
2^20 -1	This 1,048,575-bit pseudorandom pattern generates a maximum of 19 sequential zeros and 20 sequential ones (CCITT V.57).
2^23 -1	This 8,338,607-bit pseudorandom pattern generates a maximum of 22 sequential zeros and 23 sequential ones (CCITT O.151).
Progrm	This bit pattern allows the user to generate a fixed pattern that is up to 24 bits in length. The soft keys are used to enter a 1 or 0 or delete the bit at the cursor position. The arrow keys are used to position the cursor if a bit value is to be changed.

SUMMARY - This category provides a visual indication of the unit’s operating **SETUP** configuration in the left display window. Information displayed includes selected mode, framing, pattern, and other mode-specific parameters. Figure 2-22 illustrates the 2M summary display menu. The displayed information cannot be changed from the **SUMMARY** category. To change displayed **SUMMARY** parameters, the corresponding **SETUP** category must be selected and the operating parameter changed from within that category.

NOTE: The CRC and TS16 menu items are only displayed for the 2M menu and only when framing is set to Framed.

2M	Framed	CRC:Off
HDB3	2^15-1	TS16:Off

Figure 2-22
2M Summary Menu Display

RECALL/STORE - This category allows the operator to recall and/or store up to ten complete operational configurations. These configurations can be assigned a user-specified name to identify the different configuration setups.

Pressing the **SETUP CATEGORY** switch to illuminate the LED next to the RECALL/STORE label displays the first of three recall/store menus. The recall/store menus are:

Recall Program
Store Program
Name Program

1. Recall Program Menu

The first recall/store menu visible in the display window is the recall program menu. The menu name **Recall Program:** and the last recalled program is visible on the top line, and the first three program choices are visible on the bottom line of the display.

The LED in the **MORE** switch illuminates indicating that more than the three displayed program choices are available. Pressing the **MORE** switch displays the next three recall programs. Repeatedly pressing the **MORE** switch scrolls through all 10 recall programs and cycles back to the first three recall program names. In addition to the program name, a superscript number (⁰ to ⁹) appears to the right of each program name. Pressing the soft key below any displayed program name configures the unit operating parameters according to the parameters stored for that program name.

2. Store Program Menu

Pressing the **SETUP SELECT** switch on the right displays the store program menu in the display window. The top line displays **Store Program:** followed by a program name (up to five characters) and the superscript number of the program. The LED in the **MORE** switch illuminates, indicating that more program names are available. Pressing the **MORE** switch displays the next three program names. Repeatedly pressing the **MORE** switch scrolls through all ten program names and back to the first three program names. Pressing the soft key below any displayed program name stores the current unit operating parameters in the selected program. If the program is stored for the first time, as after memory is cleared, the following message is visible in the display:

Store Program: XXXXX

Yes No

Pressing the soft key below the response either stores or doesn't store the unit configuration in the displayed program. If a program had previously been stored, pressing the soft key below a program name displays the message:

Overwrite Prog XXXXX?

Yes No

This indicates that the unit configuration stored in that program will be overwritten with the current unit configuration if the soft key below the **Yes** label is pressed. If the soft key below the **No** label is pressed, the stored program is not overwritten and the current unit configuration is not saved.

Saving a program stores all of the unit operating parameters. This includes TEST MODE, SETUP, ERROR INSERT, PRINTER, RECEIVE INPUT, and OUTPUT LEVEL.

3. Name Program Menu

Pressing the right **SETUP SELECT** switch displays the name program menu in the display window. The top line displays **Name Program:** followed by a program name (up to five characters) and the superscript number of the program (⁰ to ⁹). The bottom line displays **Number Up Down**. Pressing the soft key below **Number** increments the displayed program name to the next program. Pressing the soft key below either the **Up** or **Down** label scrolls forward or backward through the series of alphanumerical characters. When the desired character is visible in the window, press the right cursor switch, located below the illuminated **ENTER** switch, to move the cursor to the next position. Then press the soft key below either the **Up** or **Down** visible in the display window until the next desired character is visible in the display. Continue this process until the program name is complete. By pressing the soft key below **Number**, the next program can be renamed. All ten program names can be modified before the changes are entered. To change the program name(s), press the **ENTER** switch. If another switch is pressed, after a change has been made for any program name, the following message is visible in the display window:

<ENTER> CHANGES?

Yes No

The soft key below either **Yes** or **No** must be pressed to save the change(s) or not. Pressing the soft key below **Yes** saves the program name change(s) and pressing the soft key below **No** deletes any change(s) and returns the program name(s) as before. See the **Auxiliary** portion later in this section for more information on SETUP menu settings.

4. SETUP SELECT

(The number preceding each description corresponds to the number in Figure 2-2.)

This front panel label is backlit when additional menu categories are available for the selected CATEGORY.

Pressing the left or right arrow on this toggle switch scrolls, respectively, backward or forward through the available menu items. Pressing the **SETUP SELECT** switch when the LED in the **ENTER** switch is illuminated, however, causes the message **<ENTER> Changes?** to be displayed on the top line and the selections (**Yes** or **No**) on the bottom line. The soft key below one of these selections must be pressed before the next menu is displayed.

5. HOME

Pressing the **HOME** switch returns the display to the first (home) menu item of the selected category; this switch is a short cut to return to the first menu item of a multi-item menu.

6. ENTER

Pressing the **ENTER** switch confirms and saves configuration changes made by the user. The LED in this switch illuminates to indicate that the user must press the **ENTER** switch to save the new operating configuration (e.g., MUX TEST rates, timed print interval, date, or time). Note that configuration changes are not effective until the **ENTER** switch is pressed. Pressing any other front panel switch, while the LED in the **ENTER** switch is illuminated causes the following message to be displayed.

```

<ENTER>  Changes?
  Yes      No
  
```

The soft key below one of these selections (**Yes** or **No**) must be pressed before the next menu is displayed. Once the change is verified or rejected, the function of the pressed switch is performed.

7. ARROW Switches

Pressing one of the two arrow switches moves the cursor in the corresponding direction on the display. These two switches are used on several menu pages in which a cursor is used to enter data. Pressing the cursor key moves the cursor one position in that direction.

8. SOFTKEYS

Three soft keys, shown in Figure 2-23, expand the operation of the INTERCEPTOR without requiring additional front panel switches. The soft keys are located below a menu item, visible on the bottom line of the display window, and are used to control the selection of the corresponding menu item.

9. MORE

The LED inside the **MORE** switch, shown in Figure 2-23, illuminates when more menu items than those displayed, are available for the selected SETUP category. Pressing the **MORE** switch displays the additional menu item(s). Repeatedly pressing the **MORE** switch displays the remaining menu item(s) and then cycles back to the first three menu items.



Figure 2-23
Softkeys and the MORE Switch

10. CATEGORY

The CATEGORY switches are two of the four ANALYSIS RESULTS switches illustrated in Figure 2-24. The two CATEGORY switches select one of the six results categories. Pressing the up arrow or down arrow on this rocker switch scrolls through the analysis results categories, located directly above the pressed switch, in the corresponding direction. An analysis results category is selected when the LED next to the category label is illuminated.

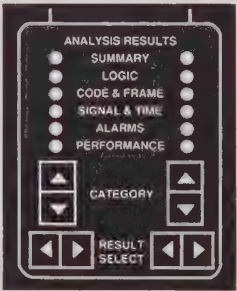


Figure 2-24
ANALYSIS RESULTS Switches

NOTE: When the ANALYSIS RESULTS CATEGORY is set to SUMMARY and all results have a zero value, the message **Results OK** is displayed. When the results are not available, the message **Results N/A** is displayed.

11. RESULT SELECT

These two rocker switches, shown in Figure 2-24, scroll through the selected results category. Pressing the left or right arrow on either of these rocker switches scrolls through the menu items of the selected results category. Pressing the left **RESULT SELECT** switch scrolls through the results category selected by the left **CATEGORY** switch, and the left half of the results display window displays the accumulated results values. Similarly, pressing

the right **RESULT SELECT** switch scrolls through the results category selected by the right **CATEGORY** switch, and the right half of the results display window displays the accumulated results values. Pressing the right arrow on the **RESULT SELECT** switch scrolls forward through the menu items of the selected results category. Pressing the left arrow on the **RESULT SELECT** switch scrolls in reverse order through the menu items of the selected results category. Table 2-3 lists the results available in each analysis results category.

Table 2-3
Results Categories

Category/Item:	Definition:
SUMMARY	
BIT ERRS	Bit Errors - The number of errored bits received since pattern synchronization was achieved.
PAT SLIP	Pattern Slips - The number of occurrences where extra or missing data bits are detected in the received data.
PAT LOSS	Pattern Synchronization Loss - The number of synchronization losses since the last test restart.
X CODE	Code Errors (where X is the selected data rate) - The number of code errors received for the selected data rate. This result accumulates after initial signal presence is detected.
X FAS	FAS Errors (where X is the selected data rate) - This result accumulates after FAS synchronization.
REBE	Remote End Block Error.
CRC ERR	CRC Errors - The total number of CRC errors detected. This result is only available for 2M operation.
X Remote	Remote Alarms (X is the rate at which the alarm is seen).
X Rx Δ PPM	Frequency Deviation - Displays the receive frequency deviation if it is outside of CCITT recommendations.
X AIS	AIS Alarms (X is the rate at which the alarm was seen).
PWR LOSS	Power Loss Count - The number of power loss occurrences detected during the current test.
RESULTS OK	This message is displayed when all of the summary results values are zero.

Table 2-3
Results Categories (continued)

Category/Item:	Definition:
LOGIC	
BIT ERRS	Bit Errors - The number of errored bits received since pattern synchronization was achieved.
BER	Bit Error Rate - The total number of bit errors received, divided by the total number of pattern bits received after initial pattern synchronization.
PAT SLIP	Pattern Slips - The number of occurrences where extra or missing data bits are detected in the received data.
SLIP SEC	Pattern Slip Seconds - The total number of test seconds in which pattern slips were detected.
PAT LOSS	Pattern Synchronization Loss - The number of synchronization losses since the last test restart.
CODE & FRAME	
X CODE	Code Errors (where X is the selected data rate) - The number of code errors received for the selected data rate. This result accumulates after initial signal presence is detected.
X CER	Code Error Rate (where X is the selected data rate) - The total number of code errors received, divided by the number of bits received. This result accumulates after initial signal presence is detected.
X FAS	FAS Errors (where X is the selected data rate) - The total number of frame alignment signal errors detected. This result accumulates after initial FAS synchronization is detected.
X FAS Wd	FAS Word (where X is the selected data rate) - This result displays the appropriate FAS word, which is different for each data rate. Any frame alignment bit within the word that is errored is displayed as an "x". This error indication is reset by pressing either the RESTART switch or the HISTORY RESET switch.
X FER	FAS Error Rate (where X is the selected data rate) - The total number of frame alignment signal errors, divided by the total number of frames received. This result accumulates after initial FAS synchronization.
X FSL	FAS Sync loss count. The number of FAS synchronization losses since the last test restart.
CRC ERR	CRC Errors - The total number of CRC errors detected. This result is accumulated after initial CRC synchronization is achieved. This result is only available for 2M operation.

Table 2-3
Results Categories (continued)

Category/Item:	Definition:
CRC ERt	CRC Error Rate - The total number of CRC errors received, divided by the total number of CRCs detected. This result is only available for 2M operation.
1 SEC CRC	1 Second CRC Count - The number of CRC errors received in the last second. This result is only available for 2M operation.
CRC FSL	FAS Sync Losses (with CRC on). The number of FAS synchronization losses since the last test restart.
2NFAS Wd	2M NFAS Word - This result displays the appropriate NFAS (not the FAS) word for the 2 Mb/s data rate.
MFAS Errs	Multiframe Errors - This result displays the number of multiframe errors.
MFAS E Rt	Multiframe Error Rate - This result displays the number of multiframe errors, divided by the number of multiframe received.
MFSL	Multiframe Sync Losses - The number of MFAS synchronization losses since the last test restart.
MFAS Wd	Multiframe Word - This result displays the status of the 8-bits making up the multiframe word. An "x" indicates a bit in error.
REBE FSL	REBE Frame Sync Losses - The total number of REBE Frame synchronization losses that have occurred as a result of receiving more than 915 REBEs in one second.
REBE	Remote End Block Errors - This result displays the number of remote end block errors. When the far end receives a CRC error, a REBE is generated.
TSn ABCD	Channel Associated ABCD Signalling bits.
SIGNAL & TIME	
Sig Loss	Signal Loss count - The number of signal losses which have accumulated since the last test restart.
X Rx Freq	Receiver Frequency, measured in Hertz, (where X is the selected data rate) - A display of the maximum deviation made on the receive clock for the active interface, measured in parts per million (ppm).

Table 2-3
Results Categories (continued)

Category/Item:	Definition:
SIGNAL & TIME	
X Rx Δ ppm	Receiver Frequency ppm, is the maximum deviation from the correct rate measured in parts per million, (where X is the selected data rate).
X Tx Freq	Generator Frequency (where X is the selected data rate). - A display of the most recent frequency measurement made on the generator clock, measured in Hertz.
TEST SEC	Test Seconds - The number of seconds counted after initial pattern synchronization, or after signal presence when using M.550.
TIME	Time - The time of day in hours, minutes, and seconds. Hours are given in the 24-hour format.
ELAP SEC	Elapsed Seconds - The number of seconds counted since the last test restart.
DATE	Date - The calendar date given in day, month, and year format.
ALARMS	
X AIS	Alarm Indication Signal (where X is the selected data rate) - An AIS alarm occurs when an unframed all ones signal is detected with less than 1E-3 BER. AIS is not possible when the interface is in frame synchronization.
TS16 AIS	Timeslot 16 Alarm Indication Signal - This alarm is active when there is all ones in TS16.
FAS DIS	FAS Distant - This alarm is active when bit 3 of "not the frame word" is set to "1." This alarm is also known as the 2M Remote Alarm.
MFAS DIS	MFAS Distant - This alarm is active when bit 6 in frame 0 is set to "1." This alarm is also known as the TS16 Remote Alarm.
X RMT	Remote Alarm (where X is the selected data rate) - This alarm is active when bit 8 of the XXX bit frame is set to "1." XXX is the 848 bit frame for 8M, 1536 bit frame for 34M, and bit 13 for bit frame 2928 for 140M.
Pwr Loss	Power Losses - The number of power loss occurrences detected during the current test.
PERFORMANCE - G.821	
AVL SEC	Available Seconds - Performed as specified in G.821.

Table 2-3
Results Categories (continued)

Category/Item:	Definition:
%AVL SEC	% Available Seconds - Calculated as specified in G.821.
UNA SEC	Unavailable Seconds - Calculated as specified in G.821.
ERR SEC	Errored Seconds - The number of available seconds which contain at least 1 bit error, as specified in G.821.
SES	Severely Errored Seconds - Calculated as specified in G.821.
%SES	% Severely Errored Seconds - Calculated as specified in G.821.
DEG MIN	Degraded Minutes - Calculated as specified in G.821.
%DEG MIN	% Degraded Minutes - Calculated as specified in G.821.
SIGNAL & TIME	
EFS	Error Free Seconds - Calculated as specified in G.821.
%EFS	% Error Free Seconds - Calculated as specified in G.821.
BER-SES	Bit Error Rate - SES - The BER calculated over the test interval, excluding severely errored seconds.
Err-SES	Bit Errors - SES - Total bit errors, excluding errors that occurred during severely errored seconds.
M.550	
ES	Errored Seconds - Total number of Available Seconds with a defect or anomaly, where X is all applicable rates.
EFS	Error Free Seconds - Total number of Available Seconds without an anomaly or defect, where X is all applicable rates.
%EFS	% Error Free Seconds - The ratio of Error Free Seconds to Available Time Seconds, where X is all applicable rates.
DEF S	Defect Seconds - The total number of Available Seconds in which a defect was detected, where X is all applicable rates.

Table 2-3
Results Categories (continued)

Category/Item:	Definition:
M.550	
SES	Severely Errored Seconds - The number of Available Seconds with any defects or an anomaly rate exceeding the extrapolated BER of 1E-3, where X is all applicable rates.
%SES	% Severely Errored Seconds - The Ratio of Severely Errored Seconds to Available Time, where X is all applicable rates.
Av T	Available Time - Every test begins in Available Time, as long as there are not 10 consecutive Severely Errored Seconds, Available Time continues.
Una T	Unavailable Time - The transition from Available Time to Unavailable Time occurs when 10 consecutive Severely Errored Seconds occur.
% Av T	%Available Time - The ratio of Available Time to Test Seconds.
MRER	Mean Residual Error Rate - The error rate for all Non-Severely Errored Seconds that are in Available Time.

12. DISPLAY HOLD

Pressing this switch, shown in Figure 2-25, halts (freezes) the accumulation of displayed results values. This allows the **CATEGORY** and **RESULT SELECT** rocker switches, respectively, to select a results category and scroll through the results category items. Even though the displayed results are halted, results values continue to accumulate because the test is still in progress. Accumulating results are stored in memory until the display hold is disabled by pressing the **DISPLAY HOLD** switch again extinguishing the LED inside this switch. Disabling the display hold updates the results to show their current values. Pressing the **TEST MODE** switch while the display hold is enabled causes a test restart and clears the **DISPLAY HOLD**.

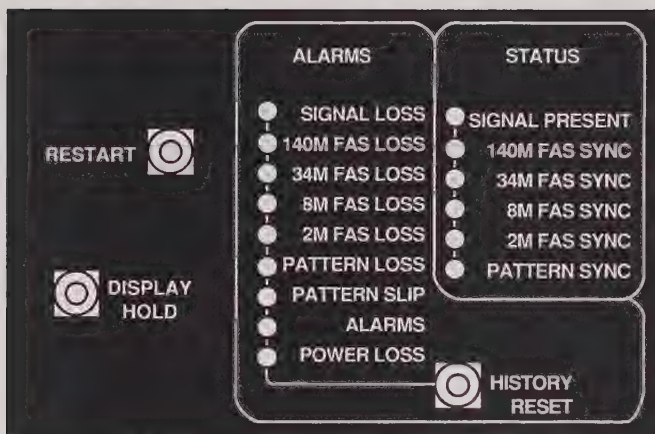


Figure 2-25
DISPLAY HOLD, RESTART, and HISTORY RESET Switches

13. RESTART

Pressing the **RESTART** switch restarts the test in progress. Restarting a test resets the test results to their zero value, and forces pattern and frame resynchronization.

14. HISTORY RESET

Pressing this switch causes the alarm LEDs to be reset. Resetting the history LEDs extinguishes any alarm LEDs that are not currently active. However, if an alarm condition is currently active, pressing the **HISTORY RESET** switch does not extinguish the active alarm LED.

15. OUTPUT LEVEL

Pressing this switch, shown in Figure 2-26, selects the output data level. The selected output level is indicated by the illuminated LED next to the corresponding front panel label. **OUTPUT LEVEL** selections are:

0 dB - Simulates 0 dB of cable loss.

-6 dB - Simulates passing the signal through enough cable to produce 6 dB of loss at one-half of the bit rate.

-12 dB - Simulates passing the signal through enough cable to produce 12 dB of loss at one-half of the bit rate.

NOTE: With the 140M option installed and selected, the **OUTPUT LEVEL** is set to **0 dB** and cannot be changed.

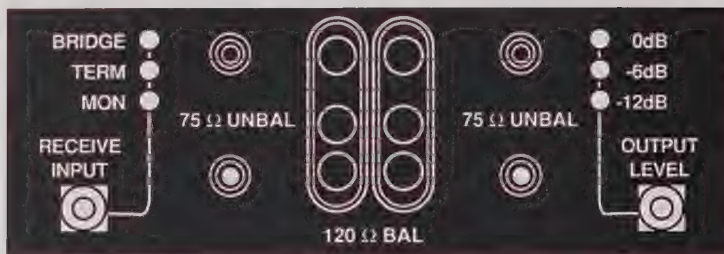


Figure 2-26
OUTPUT LEVEL and RECEIVE INPUT Switches

16. RECEIVE INPUT

Pressing this switch, shown in Figure 2-26, selects the receiver input impedance. Note that changing the input impedance clears accumulated results and sets their values to zero. RECEIVE INPUT selections are:

BRIDGE - Disconnects the INTERCEPTOR 1402 normal 75 Ω input termination and provides greater than 1,000 Ω input termination. This allows the unit to be connected to a properly terminated circuit without disrupting traffic by loading the line. This selection is available in 2M, 8M, and 34M modes only.

TERM - Connects the 75 Ω (or 120 ohm at 2 Mb/s) termination resistor. This allows the unit to properly terminate an unterminated circuit.

MON - Connects the 75 Ω (or 120 ohm at 2 Mb/s) termination resistor and adds up to 30 dB gain to compensate for up to 30 dB loss encountered at monitor access points. This allows the unit to be connected to the monitor access point of a jack field. An additional selection for the type of monitor point is available in the Auxiliary menu.

NOTE: With the 140M option installed and selected, the **BRIDGE** selection is not available.

17. RESULTS

The **RESULTS** switch is one of three PRINTER switches used to control printouts sent to an attached printer. Figure 2-27 illustrates these switches. Pressing this switch generates a printout of the current results values on an attached printer. The results printed out can be in a standard, long, summary, or short format. The results print format selected is determined by the result print auxiliary function.



Figure 2-27
Printer Switches

18. CONTROLS

Pressing the **CONTROLS** switch generates a printout of the current unit control settings on an attached printer. This provides a hard copy of the unit's current control settings.

19. ON/OFF

Pressing this switch toggles the printer selection between ON (LED inside this switch is illuminated) and OFF (the LED in this switch is extinguished). ON enables automatic status, timed prints, and error prints. When OFF, only manual printouts can be generated by pressing the **CONTROLS** or **RESULTS** switch. Toggling the printer **ON/OFF** clears the printer FIFO and aborts any prints in progress.

ON - Enables automatic printouts (e.g., status, error, or timed prints) to be generated. The auxiliary category settings determine what result conditions cause automatic printouts to be generated.

OFF - Disables automatic printouts from being generated. However, even when disabled (the LED in this switch is extinguished), pressing the **CONTROLS** or **RESULTS** switch can still generate a manual printout.

20. CODE

The **CODE** switch is one of the three error insert switches illustrated in Figure 2-28. Pressing this switch once injects a single code error at the selected data output rate. This is applicable only when AMI or HDB3 coding is selected. Holding this switch down for more than 1 second injects code errors at a preselected error rate (determined by the code error insert rate auxiliary function). When using a fixed data pattern (MARK, SPACE, 1:3, 1:4, or PROGRM), inserting code errors may also result in bit logic errors being inserted.

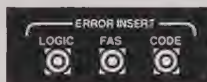


Figure 2-28
ERROR INSERT Switches

21. FAS

Pressing this switch injects a predetermined number of consecutive FAS errors (the default is 1) at the selected data output rate. This is only applicable for framed data. Holding this switch down for more than 1 second injects errors at a preselected error rate (determined by the FAS error insert rate auxiliary function). The adjacent FAS error auxiliary function determines the number of adjacent frames that are errored.

22. LOGIC

Pressing the **LOGIC** switch injects a single logic error at the selected data analysis rate. Holding this switch down for more than 1 second injects errors at a preselected error rate (determined by the logic error insert rate auxiliary function).

VOLUME

Rotating this control knob, located on the side panel, in a clockwise direction increases the beeper volume. Rotating the **VOLUME** knob in a counterclockwise direction decreases the beeper volume.

2.4.4 Auxiliary Menu Selections

This category allows the user to access specialized unit operating features that may not be frequently required. Figure 2-29 depicts the AUXILIARY menu selections. The following paragraphs contain explanations of the auxiliary menus and the choices available for each menu.

1. **Mon Gain** - Determines the gain used to recover the input signal from a monitor point. The INTERCEPTOR 1402 can compensate for up to 30 dB of the resistive loss at the monitor point. The receiver automatically compensates for any additional loss due to cable attenuation.
2. **Logic Err Insert** - Determines the rate at which logic (bit) errors are inserted on the output data. Pressing the front panel **LOGIC** switch once inserts one logic error. Pressing that switch and holding it in for more than one second inserts logic errors at the rate selected by this auxiliary function. Logic error insert rate selections are:

- 1E-3 (1 in 1,000)
- 1E-4 (1 in 10,000)
- 1E-5 (1 in 100,000)
- 1E-6 (1 in 1,000,000)

3. **Frame Err Insert** - Determines the rate at which frame errors are inserted on the output data. Pressing the front panel FAS switch once inserts the a group of FAS errors, as determined by the adjacent FAS error auxiliary menu. Pressing and holding this switch in for more than one second inserts groups of frame errors at the rate selected by this auxiliary function. It is important to remember that the number of frame errors per group is determined by the adjacent FAS error menu selection. For example, if the selected frame error insertion rate is 1E-3 (1 in 1,000), and the adjacent FAS error rate is set to 4, there are four frame errors inserted in 1,000 bits and the effective FAS error rate is 4.0E-3. Frame error insert rate selections are:

- 1E-3 (1 in 1,000)
- 1E-4 (1 in 10,000)
- 1E-5 (1 in 100,000)
- 1E-6 (1 in 1,000,000)

2

Mon Gain Res Only
Select

SETUP SELECT

Logic Err Insert: 1E-3
Rate
1E-4
1E-5
1E-6

SETUP SELECT

Frame Err Insert: 1E-3
Rate
1E-4
1E-5
1E-6

SETUP SELECT

Adjacent FAS Err: 1
#Err
2
3
4

SETUP SELECT

Code Err Insert: 1E-3
Rate
1E-4
1E-5
1E-6

SETUP SELECT

Print: RS232 RC: None
Select
Print: RS232 RC: 488*
Print: 488* RC: None
Print: None RC: RS232
Print: None RC: RS232
Print: None RC: 488*

SETUP SELECT

RS232: 9600, 8, None
Baud Data Parity
PR-55 PR40A
Baud Data Parity
300 7 Even
1200
2400
4800
9600

SETUP SELECT

IEEE 488 Address: 01
Up Down 00-30

SETUP SELECT

Printer: 40 CRLF
Width Term
80 LF
20 CR

SETUP SELECT

Result Print: Std
Long Std Sum

SETUP SELECT

Timed Print: Off
On Hour Min
Help

SETUP SELECT

Bit Error Print: Off
Fwd Rvr s On/Off
All On All Off
Fwd Rvr s On/Off

SETUP SELECT

Signal Present: Off
Fwd Rvr s On/Off
All On All Off

SETUP SELECT

Code Error Print: Off
FAS Error Print: Off
CRC Error Print: Off
Prtn Slip Print: Off
SES Error Print: Off
Pre-Pwr Loss Prit: Off

SETUP SELECT

Signal Loss: Off
Pat Sync Acquired: Off
Pat Sync Loss: Off
FAS Sync Acquired: Off
FAS Sync Loss: Off
Power Up: Off
Alarm Transition: Off
Perf Transition: Off
Frequency Drift: Off

SETUP SELECT

Mem Store: Print
Select
Histarm

SETUP SELECT

Mem Print: Off 100%
Print Clear On/Off

SETUP SELECT

Hist Buffer: On
On Off Clear

SETUP SELECT

Hist Type: Graph
Select
Text
List

SETUP SELECT

Hist Start: 00/00:00
Begin Up Down
Help

SETUP SELECT

Hist Length: 00/00:00
Auto Up Down
End Help

SETUP SELECT

Hist Result: 00/00:00
Print Prev Next

SETUP SELECT

Resync on Pat Slip: On
On/Off

SETUP SELECT

8 FAS 34 FAS 2 FAS 140 FAS
8 Remote 34 Remote 2 Remote 140 Remote
8PSL 34PSL 2PSL 140PSL
8 ASES 34 ASES 2 ASES 140 ASES
Slg Loss 34 Una T 2 Una T 140 Una T
8 Una T 34 ES 2 ES 140 ES
8 ES 34 SES 2 SES 140 SES
8 SES 34 Code 8 Code 140 Code
8 Code
Pat Slip
Bit Errs
All

SETUP SELECT

Perf: G.821
Select
M.550 In Serv
M.550 Out Serv
Custom

SETUP SELECT

Lock Front Panel?
Yes

SETUP SELECT

Site id: Alpha
Up Down

SETUP SELECT

Restart on Pwr Up: Yes
Yes No

SETUP SELECT

Date: 29/12/90
Day Month Year

SETUP SELECT

Time: 14:06
Hour Min

SETUP SELECT

Clear Memory ?
Yes

SETUP SELECT

Language: English
English Français

NOTES: Changing the timed print, date, or time auxiliary menus require the ENTER switch to be pressed to accept the new value.

The IEEE-488 address menu is only displayed when the IEEE-488 option is installed.

Figure 2-29
Auxiliary Menus

NOTE: For frame errors to be inserted, the SETUP MODE must be set to **Framed**. If **Unfram** is selected, no frame errors are inserted.

4. **Adjacent FAS Err** - Determines the number of adjacent FAS words (1, 2, 3, or 4) upon which FAS errors are inserted. This auxiliary function provides the capability to test FAS synchronization algorithms to CCITT recommendations. For 2M operation, three adjacent FAS errors cause a frame sync loss and for 8M, 34M, and 140M operation, four adjacent FAS errors cause a frame sync loss.
5. **Code Err Insert** - Determines the rate at which code errors are inserted on the output data. Pressing the front panel **CODE** switch once inserts one code error. Holding this switch pressed in for more than one second inserts code errors at the rate selected by this auxiliary function. Code errors are non-multiplying (do not cause bit errors) for pseudorandom patterns, but are multiplying (cause bit errors) for fixed patterns. Code error insert rate selections are:

- 1E-3 (1 in 1,000)
- 1E-4 (1 in 10,000)
- 1E-5 (1 in 100,000)
- 1E-6 (1 in 1,000,000)

6. **Print** - Determines the printer selection and remote control selection. Printer/Remote controller selection combinations are:

<u>Printer</u>	<u>Remote Controller</u>
None	RS232
None	488*
RS232	None
RS232	488*
488*	None
488*	RS232
None	None

* Available only when the IEEE-488 option is installed.
When the Printer menu item is set to RS232, printouts can be sent to the optional lid printer.

NOTE: If the Print menu item is set to None, no printout is generated when either the **CONTROLS** or **RESULTS** switch is pressed.

7. **Data Format** - Determines the baud rate, number of data bits, and parity of the RS-232 port. Pressing the soft key below the menu items changes the menu value. The baud rate determines the rate of data transmission. Data determines the number of data bits transmitted for each character, and parity determines whether the number of 1s transmitted is odd or even. The following choices are available for the first three menu items:

- Baud:** 300, 1200, 2400, 4800, or 9600
- Data:** 7 or 8
- Par:** None, Even, or Odd

Pressing the illuminated MORE soft key displays two additional menu items, **PR55** (lid printer option) and **PR40A**. Pressing the soft key below either of these menu items pre-sets the baud, data, and parity values for the corresponding printer.

NOTE: It is important that the data format auxiliary function is set before attempting to perform a **CONTROLS** or **RESULTS** print. If the data format auxiliary menu is not properly set for the printer being used, the printout will be unintelligible.

8. **IEEE 488 Address** - Determines the unit's IEEE-488 address. The soft key below the **Up** and **Down** menu items scroll the unit address (00 to 30) in the desired direction.
9. **Printer** - Determines the column width and termination used for printouts. The column width determines the number of characters printed on each line. The line termination determines the printer action taken at the end of a line. Pressing the soft key below the menu items changes the menu value. The following choices are available for the corresponding menu item.

Width: 40, or 80 characters

Term: CRLF, CR, or LF

10. **Result Print** - Determines the type of results print that is generated when the front panel **RESULTS** switch is pressed and a printer is connected to the INTERCEPTOR. Results print choices are:

Std - Standard. Includes the most commonly used measurements.

Long - Includes virtually every measurement.

Sum - Summary. Includes only those results that indicate errors.

Short - Includes only a few key measurements.

Each results printout is time and date-stamped. The following lists include the items for each format. G.821 and M.550 performance results are listed together, although only one set of performance measurements is available at a given time.

Std

Sig Loss

Bit Errs

BER

Pat Slip

Pat Loss

X Code (where X is the MODE data rate)

X CER (where X is the MODE data rate)

X FAS (where X is the MODE data rate)

XR_x Freq (where X is the MODE data rate)

XM PPM (where X is the MODE data rate)

XT_x Freq (where X is the MODE data rate)

Test Sec

Elap Sec

XM AIS (where X is the MODE data rate)

Std (continued)

FAS Dis

XRemote (where X is the MODE data rate)

G.821 Results

%Avl Sec

Err Sec

%EFS

%SES

%Deg Min

ANALYSIS

M.550 Results

X Def S (where X is the MODE data rate)

X Av T (where X is the MODE data rate)

XES (where X is the MODE data rate)

X SES (where X is the MODE data rate)

X Una T (where X is the MODE data rate)

X EFS (where X is the MODE data rate)

Long

Bit Errs

BER

Pat Slip

Pat Loss

X Code (where X is the MODE data rate)

X CER (where X is the MODE data rate)

X FAS (where X is the MODE data rate)

X FER (where X is the MODE data rate)

X FAS Word (where X is the MODE data rate)

2NFAS Word

XR_x Freq (where X is the MODE data rate)

XM PPM (where X is the MODE data rate)

XT_x Freq (where X is the MODE data rate)

Test Sec

Elap Sec

XM AIS (where X is the MODE data rate)

FAS Dis

X Remote (where X is the MODE data rate)

G.821 Results

Avl Sec

Una Sec

%Avl Sec

Err Sec

EFS

%EFS

SES

%SES

Deg Min

%Deg Min

Err-SES

BER-SES

M.550 Results

X Def S (where X is the MODE data rate)

X SES (where X is the MODE data rate)

X %SES (where X is the MODE data rate)

X Av T (where X is the MODE data rate)

X %Av T (where X is the MODE data rate)

X Una T (where X is the MODE data rate)

X ES (where X is the MODE data rate)

X EFS (where X is the MODE data rate)

X %EFS (where X is the MODE data rate)

X MRER (where X is the MODE data rate)

ANALYSIS

Test Mode
Signal Present
XM FAS Sync (where X is the MODE data rate)
Pattern Sync
Signal Loss
XM FAS Loss (where X is the MODE data rate)
Pattern Loss
Pattern Slip
Alarms
Power Loss

Sum - Includes any non-zero results and the following G.821 or M.550 SUMMARY results.

Bit Errs
Pat Loss
X Code (where X is the MODE data rate)
X FAS (where X is the MODE data rate)
FAS Dis
XRemote (where X is the MODE data rate)

<i>G.821</i>	<i>M.550</i>
%Avl Sec	X Def S (where X is the MODE data rate)
Err Sec	X Av T (where X is the MODE data rate)
%EFS	X ES (where X is the MODE data rate)
%SES	X SES (where X is the MODE data rate)
%Deg Min	X Una T (where X is the MODE data rate)
	X EFS (where X is the MODE data rate)

ANALYSIS
TEST MOD

11. Timed Print - Determines the time interval between automatic results printouts. The three menu choices are:

Off
Hour: 00-99
Min: 00-59

No automatic results printouts are generated if Off is selected. Setting this auxiliary function to On and entering a value for the timed print causes the LED in the **ENTER** switch to illuminate, indicating that the **ENTER** switch must be pressed to confirm the entered value. If the **SETUP SELECT** switch is pressed, without pressing the **ENTER** switch, the following message is visible in the display window:

<ENTER>CHANGES?
Yes No

Press the soft key below the desired selection Yes or No to respectively confirm or disregard the entered value. Pressing the soft key below Yes enables automatic results printouts to be generated at the end of each specified time interval, as long as the **PRINTER** switch is set ON (the LED in the ON/OFF switch is illuminated).

NOTE: It is important that the data format auxiliary function is properly set before attempting to perform a RESULTS print. If the data format is not properly set for the printer being used, the printout will be unintelligible.

12. Error Prints - Determines which events cause the automatic generation of a result print. Pressing the soft key below the Fwd or Rvrs menu item scrolls through the error print events in one direction or the other. Pressing the On/Off soft key toggles the error print selection. The following selections are available for the error print auxiliary function:

- Bit Error Print: On/Off - generates a result print when a bit error is detected.
- Code Error Print: On/Off - generates a result print when a code error is detected.
- FAS Error Print: On/Off - generates a result print when a FAS error is detected.
- CRC Error Print: On/Off - generates a result print when a CRC error is detected.
- Ptrn Slip Print: On/Off - generates a result print when a pattern slip is detected.
- SES Print: On/Off - generates a result print when a Severely Errored Second is detected
- Pre-Power Loss Print: On/Off - generates a results print when the unit powers up. This result print contains measurements that reflect the status of the test just before the power failed.
- AllOff - disables all error print events.

Enabling any or all of the error print events causes a printout to be generated within one second of detecting the corresponding error event, as long as the **PRINTER** switch is set ON (the LED in the ON/OFF switch is illuminated). An error print is generated each time the enabled error event occurs and the **PRINTER ON/OFF** switch is enabled (the LED in the switch is illuminated). The information printed out for the error print is determined by the result print auxiliary menu selection (summary, standard, long, or short).

13. Status Prints - Determines what signal condition causes a status printout. Pressing the soft key below the Fwd or Rvrs menu item scrolls through the status print events in one direction or the other. Pressing the On/Off soft key toggles the signal print selection between Off and On. The following selections are available for the auxiliary status print:

- Signal Present: On/Off - reports signal presence.
- Signal Loss: On/Off - reports signal loss.
- Pat Sync Acquired: On/Off - reports pattern synchronization.
- Pat Sync Loss: On/Off - reports loss of pattern synchronization.
- FAS Sync Acquired: On/Off - reports FAS synchronization.

- FAS Sync Loss: On/Off - reports loss of FAS synchronization.
- Power Up: On/Off - reports power being interrupted and restored.
- Alarm Transition: On/Off - reports transitions of alarms.
- Perf. Transition: On/Off - reports performance results transitions (G.821 or M.550).
- Frequency Drift: On/Off - reports frequencies out of CCITT specified ranges.

Frequency tolerances are:

±50ppm for 2M
 ±30ppm for 8M
 ±20ppm for 34M
 ±15ppm for 140M
 AllOn - enables all status prints.
 AllOff - disables all status prints.

Enabling any or all of the status print events causes a printout to be generated immediately when the enabled status change occurs and the PRINTER ON/OFF switch is enabled (the LED in the switch is illuminated). A status message printout indicates which enabled status event caused the printout and the time it occurred. The following is a typical example of a printout generated when a signal loss and re-acquisition occur.

```
Signal Loss      03:35:23    18 DEC 90
Signal Present   03:35:29    18 DEC 90
```

When M.550 performance analysis is in effect, some special processing is performed on the status prints so that only the most significant synchronization losses and alarms are reported for each rate being tested. For instance, if a mux test is being performed with an input rate of 34M and an analysis rate of 2M, let's see what happens when a FAS Sync Loss occurs at 34M. For 34M the only event detected (and reported) is the FAS Sync Loss. For 8M, an AIS is received while 34M is out of FAS Sync and this AIS is reported. There is also 8M FAS Sync Loss due to the 8M AIS, but this is NOT reported on the status prints because the previous 8M AIS was already reported. Likewise, a 2M AIS is detected and reported, but 2M FAS Sync Loss and Pattern Sync Loss are not reported although they are detected. The status prints are depicted as the following:

```
34M FAS Loss     14:41:21    27 Jun 92
8M AIS Alm On    14:41:21    27 Jun 92
2M AIS Alm On    14:41:21    27 Jun 92
```

This is a clearer indicator of what type of fault has occurred than is every possible status print were generated. When 34M FAS is regained, all of the alarm-off and Sync-gain status prints are generated. Upon sync-up, the following status prints are generated:

Instrument Description

34M FAS Gain	14:41:25	27 Jun 92
8M AIS Alm Off	14:41:25	27 Jun 92
8M FAS Gain	14:41:25	27 Jun 92
2M AIS Alm Off	14:41:25	27 Jun 92
2M FAS Gain	14:41:25	27 Jun 92
2M Pat Sync Gain	14:41:25	27 Jun 92

14. **Memory Store** - This selection provides the user with the option of choosing a portion of non-volatile memory for Memory Prints or Histogram Storage. Events are prioritized according to hierarchical importance. The Histogram Buffer enables storage of test results for histogramming, while the Memory Print function (see choice 15) enables the user to store manual or automated prints in memory for printing later.

15. **Mem Print** - Indicates the percentage of allotted memory space available for storing printout information. This allows up to 24 prints to be stored and then later printed out when a printer is available. This also allows printouts to be saved even though unit power has been interrupted. Printouts are generated when the **Print** soft key is pressed. Pressing the **Clear** soft key erases printouts that are stored in memory. Memory print selections are:

Print	Sends the stored prints to the printer device.
Clear	Erases all stored prints from the memory buffer.
On/Off	Enables and disables storage of print-outs.

Printouts received (e.g., results, control, error, or status prints) are stored as long as memory space is available. The available space is represented as a percentage of the available buffer. When the buffer is empty, 100% is visible in the display, which indicates the entire buffer is available. As the buffer is filled, the percentage displayed decreases toward 0%, in which 0% indicates the buffer is full.

16. **Histogram Buffer** - Controls the Histogram Buffer by using the buffer **On**, **Off**, or **Clear** soft keys. Note that the **Off** control does not stop the test, just the recording of the test data. Once the Histogram Buffer is full, event storage stops automatically without interrupting the test. The amount of available memory is indicated on the top line of this display as a percentage. The Memory Full is indicated on the Events Storage menu as 100%.

On	Turns Histogram Buffer on, to allow data to be stored.
Off	Turns off the histogram storage so that further data is not collected.
Clear	Erases all stored data from the histogram buffer.

The Histogram buffer capacity stores an average of 1000 event seconds of data and enables the user to select the Histogram Storage and Memory parameters. A Stored Event Second is any second containing an event that should be recorded for histogramming.

17. Histogram Type - Selects the type of Histogram Print, either GRAPH , TEXT, or LIST.

GRAPH	Uses graphics mode of printer or enables the use of a graphics printer
TEXT	Uses ASCII to record test results.
LIST	Prints out a complete list of values.

18. Histogram Start - Selects the start time for a histogram. This start time is relative to switching on the buffer. The time a histogram begins is designated as TIME ZERO, and the histogram may be programmed to turn off and resume at any time. The time choices are BEGIN, or a User-defined time. For example, a test begun at Noon on Monday, and set to resume at precisely four minutes later, will read:

BEGIN: 01/2:04.

BEGIN	Resets the Histogram start time to the start of the test.
UP	Advances each numerical value by an increment of one. Use the cursor keys to advance to the next number set.
DOWN	Performs the opposite function of UP, it increments the numerical value backwards.
HELP	Press the illuminated MORE soft key for HELP. Prompts the user to enter time in DD/HH:MM format.

19. Histogram Length - Selects the length of time for the test to be histogrammed. This length is relative to a manually-selected graph length. The INTERCEPTOR prompts the user to select the graph length. The Histogram Storage sequence over-writes the data of the previously stored test.

AUTO	The histogram prints request prints to the end of the test.
MANUAL	Enables the user to manually select a graph length.

20. Histogram Result - Selects which result is to be histogrammed. There are three choices: Print, Previous, and Next.

PRINT	Processes and sends the histogram data to the printer.
PREVIOUS	Allows the user to scroll to a previously displayed histogrammable result.
NEXT	Allows the user to scroll to the next displayed histogram result choice.

As the INTERCEPTOR processes the print request, the message **Processing Histograms - Please Wait** will appear. If there were no events to print during the specified time interval, the message **No Such Event During Specified Time** will appear on the display.

- 21. Resync on Pat Slip** - Determines how synchronization should respond to a pattern slip. When the INTERCEPTOR 1402 detects a slip, it automatically re-synchronizes to the slipped pattern without counting any bit errors or pattern sync losses, or may not attempt to resynchronize to the test pattern.

ON The unit detects and counts pattern slips, and attempts to re-synchronize.
OFF The unit detects pattern slips and pattern synchronization is disabled.

- 22. Performance** - Determines the type of performance analysis results to be performed. Performance selections are:

G. 821 Performs an Out-of-Service performance analysis based on BER measurements.

M.550 In Serv Performs an M.550 In-Service performance analysis based on FAS Errors, CRC Errors, alarm conditions, and other In-Service measurements. In this mode, Pattern Synchronization is disabled.

M.550 Out Serv Performs an M.550 Out-of-Service performance analysis similar to M.550 In-Service except that BER measurements are included in the analysis.

Custom Performs a performance analysis based on the M.550 techniques described above, but the user can customize how Severely Errored Seconds are defined.

For more information about the performance monitoring capabilities of the INTERCEPTOR 1402, refer to the Appendices.

- 23. Lock Front Panel?** - Determines whether the front panel controls are functional or locked out.

The Lock Front Panel selections are:

Yes Locks out the front panel controls.
No Returns the normal functions to the front panel controls.

When locked out, the message:

Panel Locked
Hold ENTER to Unlock

is visible in the display and no configuration changes are allowed. This prevents the unit configuration from being changed inadvertently. However, even though the front panel configuration controls are locked out, the results can be viewed by pressing the **RESULT SELECT** and **CATEGORY** switches.

Hold the **ENTER** key pressed in for several seconds until **Lock Front Panel?** is again visible in the display window. At this time all the front panel switches are again functional.

24. Site ID - Site Identification identifies a site in which the INTERCEPTOR instrument is used in a specific network, and assigns a specific 8 character (or less) alphanumeric identifier to the site under test. To form and modify this number, use the left and right arrow keys to position the cursor under the character, and use the up and down keys to change the value of the character. The unit's site identifier is also displayed on Controls Prints and Results Prints. Site ID is accessible via remote control.

25. Restart on PwrUp - Restart on Power Up. This selection ensures that accidental power losses during long term tests do not clear previously accumulated results. This selection may be made in the Auxiliary category RESTART ON PWR UP:OFF. The default selection is ON.

ON Restarts all test results after power cycle.
OFF Continues to gather test results after the power cycle, without clearing previous test results.

26. Date - Allows the current date to be set in a dd/mm/yy format (where dd = day, mm = month, and yy = year). Date selections are:

Day: 01-31
Month: 01-12
Year: 00-99

Pressing the soft key below the corresponding menu item increments the displayed value. Changing the date causes the LED in the **ENTER** switch to illuminate indicating that the **ENTER** switch must be pressed to confirm the entered value. If the **SETUP SELECT** switch is pressed, the message:

<ENTER>CHANGES?
Yes No

is visible in the display window. Press the soft key below the desired selection to confirm (Yes) or disregard (No) the entered date.

27. Time - Sets the current time, in the hh:mm format (where hh = hour and mm = minute). Time selections are:

Hour: 00-24
Min: 00-59

Pressing the soft key below the corresponding menu item increments the displayed value. Changing the time causes the LED in the **ENTER** switch to illuminate indicating that the **ENTER** switch must be pressed to confirm the entered value. If the **SETUP SELECT** switch is pressed, the message:

<ENTER>CHANGES?
Yes No

is visible in the display window. Press the soft key below the desired selection to confirm (Yes) or disregard (No) the entered time.

Instrument Description

28. **Clear Memory?** - Allows the user to clear all NOVRAM. Pressing the soft key below the **Yes** menu item does not immediately clear memory. Another message is displayed, allowing one more chance to abort clearing memory. The message is:

ARE YOU SURE?
Yes No

Pressing the soft key below the **Yes** menu item clears memory, resetting the unit operating parameters to their default values. Refer to Table 3-1 in this manual for a list of the default values. Pressing the soft key under **No** displays the menu item:

Clear Memory?
Yes

29. **Language** - Determines the language (English or French) that is used to display menus, messages, results and printouts. Language choices are:

English
Frçais

2.4.5 Indicators

This section provides information on the INTERCEPTOR front panel indicators. Besides the display, which was described previously, two types of indicators are used on the INTERCEPTOR front panel: single LEDs and backlit panel labels.

Discrete LEDs illuminate to indicate: (1) that a key is valid to use (**MORE** and **ENTER** switches); (2) that a function is enabled (SELF LOOP, LOGIC, FAS, CODE, ON/OFF, and DISPLAY HOLD); or (3) the current status conditions (all other LEDs).

The backlit front panel labels are the SETUP SELECT, Nx64, and VOICE labels. The SETUP SELECT label is backlit when additional menu pages are available, and the setup select key may be used to see them. The Nx64 label is backlit when Nx64 analysis is selected for the analysis rate during MUX operation. The VOICE label is backlit when Nx64 analysis is selected for the analysis rate during MUX operation and the Analysis Mode is set to 600Ω or Hndset.

ALARMS

There are nine red alarm LEDs, illustrated in Figure 2-29, used to indicate when the associated alarm condition occurs. Once an alarm LED illuminates, it remains illuminated until the **HISTORY RESET** or **RESTART** switch is pressed, even though the condition that caused the alarm is no longer present. An explanation of each alarm LED and the condition causing it to illuminate follows:

SIGNAL LOSS - Illuminates when the selected interface detects the loss of the incoming signal.

140M FAS LOSS - Illuminates when the optional 140M interface detects that FAS synchronization is lost for four consecutive frames.

34M FAS LOSS - Illuminates when the 34M interface detects that FAS synchronization is lost for four consecutive frames.

8M FAS LOSS - Illuminates when the 8M interface detects that FAS synchronization is lost for 4 consecutive frames.

2M FAS LOSS - Illuminates when the 2M interface detects that a valid FAS synchronization has been lost for 3 consecutive frames. If TS16 is enabled, an additional result is available in the Alarms Result category (and Summary category), which indicates the status of MFAS Loss (and History).

PATTERN LOSS - Illuminates when the pattern synchronization is lost. When using G.821 performance, this is defined as 250 bit errors in less than 1000 bits. When using M.550, this is defined as 20% BER for a period of one second.

PATTERN SLIP - Illuminates when a pattern slip is detected.

ALARMS - Illuminates when a transmission alarm occurs. The cause for this LED may be found by viewing the analysis results ALARM category in the display window. Alarm conditions that cause this LED to illuminate are: 2M AIS, 8M AIS, 34M AIS, 140M AIS, FAS Distant (TS0 Remote Alarm), MFAS Distant (TS16 Remote Alarm), TS16 AIS, 8M Remote Alarm, 34M Remote Alarm, and 140M Remote Alarm. Pressing the **HISTORY RESET** switch extinguishes the ALARMS LED if the alarms are no longer active.

POWER LOSS - Illuminates when the unit is turned on. If power is interrupted during a test, this LED illuminates and remains illuminated, until the **HISTORY RESET** switch is pressed, indicating that power was interrupted.

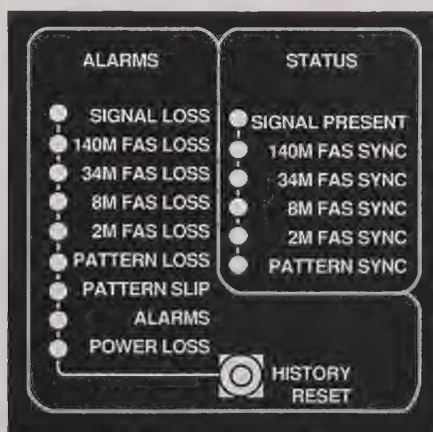


Figure 2-30
ALARMS and STATUS LEDs

STATUS

These six LEDs, illustrated in Figure 2-31, indicate the current condition for the data being monitored. These conditions include: Signal Present, 140M FAS Synchronization, 34M FAS Synchronization, 8M FAS Synchronization, 2M FAS Synchronization, and Pattern Synchronization.

SIGNAL PRESENT - This LED illuminates when the interface detects the presence of a correct incoming signal. If the received rate is different from the selected operating rate, the message **WRONG INPUT RATE** is shown in the display window.

140M FAS SYNC - This LED illuminates when the unit achieves FAS synchronization for 3 consecutive frames at the 140M data rate. This LED remains illuminated until FAS synchronization is lost.

34M FAS SYNC - This LED illuminates when the unit achieves FAS synchronization for 3 consecutive frames at the 34M data rate. This LED remains illuminated until FAS synchronization is lost.

8M FAS SYNC - This LED illuminates when the unit achieves FAS synchronization for 3 consecutive frames at the 8M data rate. This LED remains illuminated until FAS synchronization is lost.

2M FAS SYNC - This LED illuminates when the 2M interface detects a valid framed sequence for at least 2 consecutive frames. This LED remains illuminated until FAS synchronization is lost. If TS16 is enabled, an additional result is available in the Alarms Result Category that indicates the status of MFAS synchronization.

PATTERN SYNC - This LED illuminates when the unit achieves pattern synchronization at the selected analysis data rate. This LED remains illuminated until pattern synchronization is lost.

INPUT

These four LEDs, shown in Figure 2-32, indicate the selected input data rate by illuminating the LED next to the current selection. The input rate is selected by using TEST MODE switch or the soft keys, when in MUX mode, to select the desired data rate. Selection of 140M is not allowed unless the 140 Mb/s option is installed.

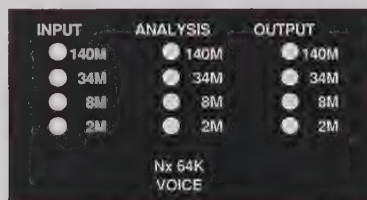


Figure 2-31
INPUT, ANALYSIS, and OUTPUT Indicators

ANALYSIS

These four LEDs and two backlit labels, shown in Figure 2-32, indicate the selected analysis data rate by illuminating the LED next to or backlighting the current selection. The analysis rate is selected by using the **TEST MODE** switch or the soft keys, when in MUX mode, to select the desired data rate. Selection of 140M is not allowed unless the 140 Mb/s option is installed. Similarly, the Nx64 and VOICE labels can be backlit only when the Nx64 option is installed and selected as the analysis rate.

OUTPUT

These four LEDs, also shown in Figure 2-32, indicate the selected output data rate by illuminating the LED next to the current selection. The output rate is selected by using the **TEST MODE** switch or the soft keys, when in MUX mode, to select the desired data rate. Selection of 140M is not allowed unless the 140 Mb/s option is installed.

2.4.6 Connectors

The following sections describe the physical connectors and the signals present on these connectors. These connectors are located on the front panel and on the side panel. Figure 2-32 illustrates the front panel signal connectors and Figure 2-33 illustrates the side panel connectors.

PRINTER

This front panel, 8-pin, circular connector, shown in Figure 2-33, provides the interface between the INTERCEPTOR and the optional lid printer. With the lid printer attached by this connector, printouts can be generated manually or by a remote controller.



Figure 2-32
PRINTER Connector

75 Ω UNBAL

There are four front panel unbalanced connectors, shown in Figure 2-32. Two are BNC connectors and two are 1.6mm x 5.6mm connectors. Each connector type has one input and one output. The impedance for these connectors is 75 ohms, with the center conductor being signal and the shield being ground.

NOTE: The front panel BNC and 1.6/5.6mm connectors are used for input and output of 2M, 8M, and 34M. The connectors for the 140M input/output are located on the right side panel of the INTERCEPTOR 1402.

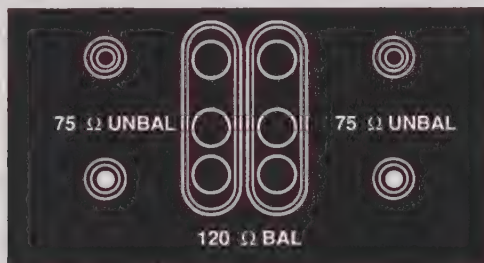


Figure 2-33
Input and Output Signal Connectors for 2, 8, and 34M

120 Ω BAL

There are two front panel “banana” connectors: one for input, on the left, and one for output, on the right, as shown in Figure 2-34. The impedance for each of these connectors is 120 ohms.

TX CLK IN

This side panel BNC connector, shown in Figure 2-35, accepts a TTL-level signal for use when the SETUP TIMING category is set to Ext (external). For proper operation, the frequency present at the transmit clock input (TX CLK IN) should be the same as the selected Tx data rate. If the external clock frequency is not the same as the transmission data rate, an improper pulse shape could result.

RZ/NRZ IN

This side panel BNC connector, shown in Figure 2-35, accepts a TTL-signal level for use when the SETUP MODE category is set to either RZ or NRZ. When either of these coding selections is made, the front panel connectors are disabled. When RZ coding is selected, the INTERCEPTOR expects to receive a pulse having a 50% duty cycle (the pulse is high for half of the time interval and the other half of the time interval is returned to zero). When NRZ coding is selected, the INTERCEPTOR expects to receive a pulse having a 100% duty cycle (the pulse occupies all of the time interval allowed for the pulse). With either RZ or NRZ selected, the clock is recovered from the data at this connector.

TX CLK OUT

This side panel BNC connector, shown in Figure 2-34, provides a TTL level signal output at the transmitted data rate.

RZ/NRZ OUT

This side panel BNC connector, shown in Figure 2-34, accepts a TTL-signal level for use when the SETUP MODE category is set to either RZ or NRZ. When either of these coding selections is made, the front panel connectors are disabled. The output at this connector is a TTL representation of the transmitted data. The output signal at this connector is RZ when the MODE Coding is set to either AMI or HDB3 or RZ if is selected from the SETUP MODE menu. If NRZ is selected, a full-bit data signal is output at this connector.

POWER

This three prong, IEC (International Electrotechnical Commission) 320 “cold” connector receptacle accepts the mating connector for the line power cord. For proper operation, the AC line voltage must be 50 Hz to 60 Hz, and between 100 VAC and 250 VAC. The line fuse is located below the power receptacle. The fuse can be accessed by removing the power cord and firmly pulling the fuse assembly out from the unit. The line fuse is 2A and measures 5mm x 20mm. There is room in the fuse assembly for a spare fuse.

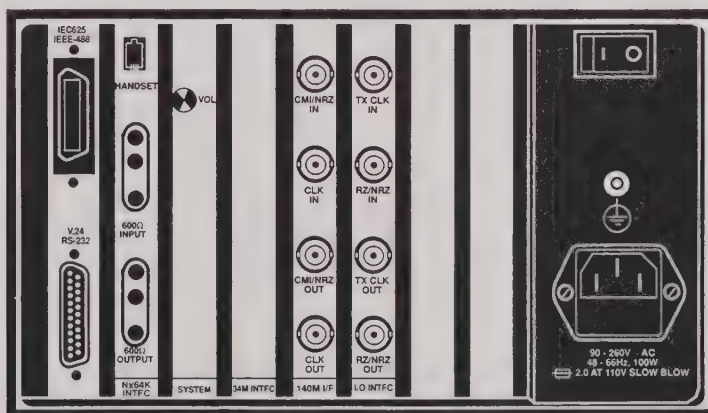


Figure 2-34
Side Panel Input and Output Signal Connectors

V.24/RS232

This multi-pin connector provides access between the INTERCEPTOR and a serial printer or controller. For more information about this connector, refer to Section 3.

IEEE-488/IEC625

With the IEEE-488/IEC625 option installed, this multi-pin connector provides access between the INTERCEPTOR and a parallel printer or controller. For more information about this connector, refer to Section 3.

2

SECTION 3 PRINTOUTS

3.1 INTRODUCTION

This section contains information on using the INTERCEPTOR 1402 with a compatible printer or suitable remote controller. The printer connection, set-up, and operation are described later in this section. The printouts (results, controls, status, and histogram prints) that the INTERCEPTOR generates are also described in this section.

3.2 PRINTER INTERFACE

The serial RS-232 Printer/Controller Interface is the standard printer interface. Two connectors on the INTERCEPTOR, one on the front panel (labeled PRINTER) and one on the side panel (labeled RS232/V.24), allow serial printers to be attached to the INTERCEPTOR.

3.2.1 The PRINTER Connector

The eight-pin, circular PRINTER connector (located on the front panel) provides power and the control lines required to operate the lid printer. The PRINTER connector is wired in parallel with the side panel RS-232 connector. As a result, it is only possible to have one device connected at a time.

3.2.2 RS-232/V.24 Printer/Controller Interface Connector

The RS-232 Printer/Controller Interface connector (located on the side panel) is a 25-pin, D-type, female connector. Table 3-1 lists the pin assignments for this side panel connector.

Table 3-1
RS-232 Printer/Controller Interface Connector Pin Assignments

Pin No.:	Designation EIA/CCITT:	Signal Description:	Status:
1	AA —	Protective Ground	Connected to chassis ground
2	BA 103	Transmitted Data (TD)	Data transmitted to the INTERCEPTOR (from the printer)
3	BB 104	Receive Data (RD)	Data received by the printer (from the INTERCEPTOR)
5	CB 106	Clear to Send (CTS)	Output HIGH when the INTERCEPTOR is ready to receive

Table 3-1
RS-232 Printer/Controller Interface Connector Pin Assignments (Continued)

Pin No.:	Designation EIA/CCITT:	Signal Description:	Status:
6	CC 107	Data Set Ready (DSR)	Output HIGH when the INTERCEPTOR power is on
7	AB 102	Signal Ground	Connected to signal ground
8	CF 109	Received Line Signal Detector (RLSD)	Output HIGH when the INTERCEPTOR power is on
20	CD 108/2	Data Terminal Ready (DTR)	Input must be HIGH before the INTERCEPTOR can send data

Data communicated via the RS-232 Printer/Controller Interface is asynchronous serial data, using standard American Standard Code for Information Interchange (ASCII) format characters. The printer interface can operate at baud rates of 300, 1200, 2400, 4800, or 9600. The INTERCEPTOR sends two stop bits and expects received data to have one or more stop bits.

The number of data bits (7 or 8), parity bits (Odd, Even, or None), and line termination (CR, LF, or CRLF) can be selected using the auxiliary menus described later in this section.

For a description of the IEC625/IEEE-488 Printer Interface, see Section 3.8 of this manual.

3.3 COMPATIBLE SERIAL PRINTERS

Compatible printers can be connected to the side panel RS232/V.24 connector or to the front panel PRINTER connector. The side panel RS232/V.24 connector is configured as Data Communications Equipment (DCE), allowing the INTERCEPTOR to be directly connected to Data Terminal Equipment (DTE). Connect the optional lid printer (PR-55) to the front of the unit via the 8-pin PRINTER connector.

The INTERCEPTOR drives the TTC PR-45 thermal printer or the PR-55 lid printer through the front panel PRINTER connector. With the standard RS-232/V.24 Printer/Controller Interface, the INTERCEPTOR can drive most serial printers. The connectors for these printers are located on the side panel of the INTERCEPTOR.

3.4 FRONT PANEL PRINTER CONTROL

With a printer attached to either the front panel or side panel connector, the INTERCEPTOR auxiliary menu selections determine the information that is sent to the printer and the printout format.

With the **AUXILIARY SETUP** category selected, use the **SETUP SELECT** switch to select the print driver, the data format (baud, data bits, and parity), the type of result print (long, standard, summary, or short), and the events that cause automatic printouts to be generated. These auxiliary menu choices combine to provide the user with flexibility in generating printouts when using a wide variety of printers. The following sections describe the printer control switches and the auxiliary menus used to generate these printouts.

3.4.1 PRINTER Switches

Three front panel switches (**ON/OFF**, **CONTROLS**, and **RESULTS**) located below the **PRINTER** label, are used to manually generate printouts on the attached printer. It is important to note that before pressing the **CONTROLS** or **RESULTS** switch, the printer auxiliary menus (such as device selection and baud rate) must be properly set for the attached printer.

ON/OFF - Pressing the **ON/OFF** switch controls the generation of automatic printouts (e.g., timed, error or status prints). When the LED inside this switch is illuminated, automatic printouts can be generated. Only manual printouts are generated when the LED inside this switch is extinguished. Generate manual printouts at any time by pressing either the **CONTROLS** or **RESULTS** switch. In addition, the **INTERCEPTOR** generates Histogram and Memory Prints. See Section 2 of this document for full explanations of these manual print choices.

CONTROLS - Pressing the **CONTROLS** switch prints out the status of the front panel control settings and the menu selections. Each control printout is time- and date-stamped at the top of the printout. A controls print provides enough information to allow a previous **INTERCEPTOR** test setup to be duplicated. Figure 3-1 illustrates a typical **CONTROLS** printout.

RESULTS - Pressing the **RESULTS** switch generates a printout of accumulated results values. The items included in a results print are determined by the setting of the result print auxiliary selection. Results printout selections are: summary, standard, long, or short. More information about these results printouts is provided later in this section. Figure 3-1 depicts an 80-column and a 40-column results print.

3.4.2 Printer-Related Auxiliary Menus

The auxiliary menu settings determine the information printed out for the result and control printouts and the format these printouts take. Auxiliary menu selections can be viewed by pressing the **SETUP CATEGORY** rocker switch until the LED next to the **AUXILIARY** label is illuminated. With the **AUXILIARY** category selected, the **SETUP SELECT** label is backlit, indicating that additional menu selections are available. Pressing the right arrow on the **SETUP SELECT** switch displays the next auxiliary menu selection. Each time this switch is pressed, the next auxiliary menu is displayed.

The following auxiliary menu settings support attached printers, determine what is printed out, and in what format. Following the menu list is an explanation of each menu.

Manual Print					
Site Id: ALPHA					
11:46:25 28 Aug 92					
Test T: 14:38:24					
Perf: M550 Out Srv					
Rx Trib	140M	34M	8M	2M CRC	64K
		1	1	1	01
Sig Loss	0				
Code Err	0				
CER	0. E-12				
Rx Freq	139261720	34367854	8447971	2047995	
PPM	-16	-4	-3	-4	
Tx Freq	139261720	34367853	8447972	2047993	
AIS	0	0	0	0	
TS16 AIS				0	
Rem Alm	0	0	0	0	
MFAS Dis				0	
FAS Loss	0	0	0		
CRC FSL				0	
REBE FSL				0	
MFSL				0	
FAS Err	0	0	0	0	
MFAS Err				0	
FER	0. E-09	0. E-09	0. E-08	0. E-08	
MFER				0. E-07	
CRC Err				0	
CRC E Rt				0. E-07	
REBE				0	
Pat Loss					0
Pat Slip					0
Bit Err					0
BER					0. E-09
%SES	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
%Av T	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
ES	0	0	0	0	0
%EFS	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %

Figure 3-1
80-Column and 40-Column Results Prints

Manual Print		
Site Id: ALPHA		
11:45:49 28 Aug 92		
Test T: 14:37:48		
Perf: M550 Out Srv		
	140M	34M
Rx Trib		1
Sig Loss	0	
Code Err	0	
CER	0. E-12	
Rx Freq	139261720	34367853
PPM	-16	-4
Tx Freq	139261720	34367852
AIS	0	0
TS16 AIS		
Rem Alm	0	0
MFAS Dis		
FAS Loss	0	0
CRC FSL		
REBE FSL		
MFSL		
FAS Err	0	0
MFAS Err		
FER	0. E-09	0. E-09
MFER		
CRC Err		
CRC E Rt		
REBE		
Pat Loss		
Pat Slip		
Bit Err		
BER		
%SES	0.00 %	0.00 %
%Av T	100.00 %	100.00 %
ES	0	0
%EFS	100.00 %	100.00 %

Figure 3-1
80-Column and 40-Column Results Prints (Continued)

	8M	2M CRC
Rx Trib	1	1
Sig Loss		
Code Err		
CER		
Rx Freq	8447971	2047994
PPM	-3	-4
Tx Freq	8447972	2047993
AIS	0	0
TS16 AIS		0
Rem Alm	0	0
MFAS Dis		0
FAS Loss	0	
CRC FSL		0
REBE FSL		0
MFSL		0
FAS Err	0	0
MFAS Err		0
FER	0. E-08	0. E-08
MFER		0. E-07
CRC Err		0
CRC E Rt		0. E-07
REBE		0
Pat Loss		
Pat Slip		
Bit Err		
BER		
%SES	0.00 %	0.00 %
%Av T	100.00 %	100.00 %
ES	0	0
%EFS	100.00 %	100.00 %

Figure 3-1
80-Column and 40-Column Results Prints (Continued)

	64K
Rx Trib	01
Sig Loss	
Code Err	
CER	
Rx Freq	
PPM	
Tx Freq	
AIS	
TS16 AIS	
Rem Alm	
MFAS Dis	
FAS Loss	
CRC FSL	
REBE FSL	
MFSL	
FAS Err	
MFAS Err	
FER	
MFER	
CRC Err	
CRC E Rt	
REBE	
Pat Loss	0
Pat Slip	0
Bit Err	0
BER	0. E-09
%SES	0.00 %
%Av T	100.00 %
ES	0
%EFS	100.00 %

Figure 3-1
80-Column and 40-Column Results Prints (Continued)

```

CONTROLS PRINT          11:36:12 21 Nov 91
Test Mode MUX/DMUX      Input Rate      34M
Output Rate      34M      Analysis Rate    2M
2M Framing       On       Time slot 16    Off
CRC4             Off      34 to 8 Drop    1
8 to 2 Drop      1        2 to 8 Insert   1
2 to 8 Fill      1's      8 to 34 Insert  1
8 to 34 Fill     1's      Pattern      2^15-1
Logic Error      Off      Log Err Rate  1E-3
FAS Error        Off      FAS Err Rate  1E-3
Adj FAS Err      1        Code Error     Off
Code Err Rate 1E-3      Self Loop      On
Rx Input         Term     Tx Level       0dB
Timing          Internal  Tx 2M Fas Dis  Off
Tx 2M AIS        Off      Tx 8M Rem      Off
Tx 8M AIS        Off      Tx 34M Rem     Off
Tx 34M AIS       Off      Program #      0
AUXILIARY SETUP
Printer          Off      Resync on Slip On
34M Mon Pt       Res      Error Prints   Off
Timed Prints     Off      Status Prints  Off
Memory Prints    Off
Performance Meas.
Bit Anom.        On       Code Anom.     On
Frame Anom.      On       Crc Anom.      On
Rebe Anom.       On       AIS Anom       On
Pat Sync Dft     On       Sig Pres Dfct  On
Fram Sync Dft    On       Rem Alm Dft    On
2 Code SES Thr               2048
2 FAS SES Thr                28
2 CRC SES Thr                830
2 REBE SES Thr               830
2 Code DM Thr               122
2 FAS DM Thr                 3
2 CRC DM Thr                 7
8 Code SES Thr              8448
8 FAS SES Thr               99
8 Code DM Thr              506
8 FAS DM Thr                 3
34 Code SES Thr             34368
34 FAS SES Thr              223
34 Code DM Thr              2062
34 FAS DM Thr               14
140 Code SES Thr            208896
140 FAS SES Thr             568
140 Code DM Thr            8355
140 FAS DM Thr              35
Print Fmt        Summ      Cntrlr Dev    None
Print Dev        RS232     RS232 Baud    9600
RS232 Data bits  8        RS232 Parity  None
IEEE488 Address  0

```

Figure 3-2
Typical CONTROLS Printout

Print Auxiliary Menu

The print auxiliary menu is used for selecting which interface (RS232 or None) is used for printing and which interface is used for remote control (None or RS232) operation. However, if the optional IEEE-488/IEC625 remote control interface is installed, additional menu item selections are available.

NOTE: For a printout to be generated, the Print menu item must be set to either RS232 or 488. If Print is set to None, no printout is generated.

Press the soft key below the Select menu item to change the Print/RC selection. Figure 3-3 illustrates the print auxiliary menu.

Print: RS 232	RC: None
Select	
Print: RS232	RC: 488*
Print: 488*	RC: None
Print: 488*	RC: RS232
Print: None	RC: None
Print: None	RC: RS232
Print: None	RC: 488*

Figure 3-3
Print Auxiliary Menu Selections

* The 488 choices are only displayed when the IEEE-488 option is installed.

As can be seen from the menu selections, the Printer and RC menu items cannot be set for the same physical device at the same time.

Data Format Auxiliary Menu

The data format menu allows the baud rate, number of data bits, and parity bit to be manually selected. These three menu items can be selected by pressing the soft key below each menu item to scroll through the parameter values for each item. Figure 3-4 illustrates the RS-232 data format menu. Data format menu item selections are:

Baud: 300, 1200, 2400, 4800, or 9600
Data: 7 or 8
Par: Even, Odd, or None

RS 232: 9600, 8, None		
Baud	Data	Parity
PR-55	PR40A	
300	7	Even
1200		Odd
2400		
4800		
9600		

■ MORE

Figure 3-4
RS-232 Data Format Auxiliary Menu Selections

Pressing the illuminated **MORE** soft key displays two additional menu items: PR-55 and PR40A. Pressing the soft key below either of these menu items automatically configures the data format parameters (baud rate, data bits, and parity) for the selected printer. When the PR-45 thermal printer is used, press the PR-55 menu soft key to configure the INTERCEPTOR for operation with the PR-45 printer.

PR-55: (9600, 8, None)
PR40A: (2400, 8, None)

Printer Auxiliary Menu

The printer menu allows the printer line width and line termination to be specified. Pressing the soft key below the menu item scrolls through the available selections. The **Width** selection determines the number of characters printed on each line, and the **Term** selection determines the printer action (carriage return, linefeed, or carriage return and linefeed) taken at the end of a printed line. The selections for the menu items are:

Width: 40 or 80
Term: CR, LF, or CRLF

Results Print Auxiliary Menu

The results print menu determines what results are printed when the front panel RESULTS switch is pressed or a timed print is generated. Results print selections are:

Long
Std (Standard)
Sum (Summary)
Short

Depending on which results are desired, one of these three results prints should be selected.

Items printed out for these three results prints are determined by results values and other configuration selections (e.g., G.821 or M.550 performance). The M.550 performance results are listed to the right of the G.821 results. Each printout is time-stamped and date-stamped at the beginning of the printout. The following lists include the items printed out for the corresponding results menu selection.

NOTE: It is important to properly set the data format auxiliary function before attempting to perform a RESULTS print. If the data format is not set properly for the printer being used, the printout may be unreadable.

Std

Sig Loss

Bit Errs

BER

Pat Slip

Pat Loss

X Code (where X is the MODE data rate)

X CER (where X is the MODE data rate)

X FAS (where X is the MODE data rate)

XR_x Freq (where X is the MODE data rate)

XM PPM (where X is the MODE data rate)

XT_x Freq (where X is the MODE data rate)

Test Sec

Elap Sec

XM AIS (where X is the MODE data rate)

FAS Dis

XRemote (where X is the MODE data rate)

ANALYSIS

G.821 Results

%Avl Sec

Err Sec

%EFS

%SES

%Deg Min

M.550 Results

XDef S (where X is the data rate)

XAv T (where X is the data rate)

XES (where X is the data rate)

XSES (where X is the data rate)

XEFS (where X is the data rate)

XUna T (where X is the data rate)

Long

Bit Errs
 BER
 Pat Slip
 Pat Loss
 X Code (where X is the MODE data rate)
 X CER (where X is the MODE data rate)
 X FAS (where X is the MODE data rate)
 X FER (where X is the MODE data rate)
 X FAS Word (where X is the MODE data rate)
 2NFAS Word
 XR_x Freq (where X is the MODE data rate)
 XM PPM (where X is the MODE data rate)
 XT_x Freq (where X is the MODE data rate)
 Test Sec
 Elap Sec
 XM AIS (where X is the MODE data rate)
 FAS Dis
 X Remote (where X is the MODE data rate)

G.821 Results

Avl Sec
 Una Sec
 Err Sec
 EFS
 %EFS
 SES
 Deg Min
 %Deg Min
 Err-SES
 BER-SES

M.550 Results

X DEF S (where X is the data rate)
 X SES (where X is the data rate)
 X%SES (where X is the data rate)
 X Avl T (where X is the data rate)
 X %Av T (where X is the data rate)
 %SES (where X is the data rate)
 X Una T (where X is the data rate)
 X EFS (where X is the data rate)
 X %EFS (where X is the data rate)
 X MRER (where X is the data rate)

ANALYSIS

Test Mode
 Signal Present
 XM FAS Sync (where X is the MODE data rate)
 Pattern Sync
 Signal Loss
 XM FAS Loss (where X is the MODE data rate)
 Pattern Loss
 Pattern Slip
 Alarms
 Power Loss

Sum - Includes any non-zero results and the following G.821 or M.550 SUMMARY results.

- Bit Errs
- Pat Loss
- X Code (where X is the MODE data rate)
- X FAS (where X is the MODE data rate)
- FAS Dis
- XRemote (where X is the MODE data rate)

<i>G.821 Results</i>	<i>M.550 RESULTS</i>
%Avl Sec	X Def S (where X is the data rate)
Err Sec	X SES (where X is the data rate)
%EFS	%SES (where X is the data rate)
TEST MOD	X ES (where X is the data rate)
	X Av T (where X is the data rate)
	X Una T (where X is the data rate)
	X EFS (where X is the data rate)

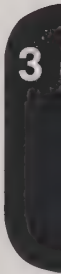
Timed Print Auxiliary Menu

The timed print menu allows the user to automatically generated results prints at specified time intervals. If this menu is set to Off, no timed printouts are generated. However, if this menu is set to On, the displayed time is the time interval between printouts. To change the time interval, the left and right arrow keys may be used to position the cursor under each digit of the displayed time. With the cursor in place under a digit, that digit may be changed by pressing the Up or Down soft key.

After the desired time interval is visible in the display, press the **ENTER** switch to enter the new time interval and extinguish the LED inside the **ENTER** switch. Pressing the **SETUP SELECT** rocker switch without pressing the **ENTER** switch displays the message:

<ENTER>CHANGES?
Yes No

Press the soft key below the desired choice. Pressing the soft key below the Yes menu item enters the new time and pressing the soft key below the No menu item resets the timed print interval to the previous setting.



Error Print Auxiliary Menu

The error print menu determines what error events cause a results print to be generated. Figure 3-5 illustrates the error print auxiliary menu. Enabling an error print menu causes a results print to be generated when that error condition occurs. The following error print menus are displayed one at a time by repeatedly pressing the soft key below the Fwd (forward) or Rvrs (reverse) menu items:

- Bit Error Print
- Code Error Print
- FAS Error Print
- CRC Error Print
- Ptrn (Pattern) Slip Print
- SES Error Print
- Pre-Pwr Loss Print

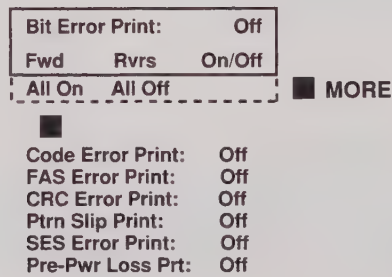


Figure 3-5
Error Print Auxiliary Menu

The three menu selections for error prints are:

- Fwd (Scroll Forward)
- Rvrs (Scroll Backward)
- On/Off

Pressing the Fwd soft key scrolls forward through the error print menus (from top to bottom) and pressing the Rvrs soft key scrolls backward through the error print menus (from bottom to top). Pressing the On/Off soft key toggles the displayed error print menu item from its present state to the opposite condition.

The LED inside the More soft key illuminates indicating more than the three displayed menu item selections are available. Pressing the More soft key displays the final two menu item selections:

AllOn
AllOff

Pressing the soft key below the AllOn or AllOff menu item, respectively enables or disables all of the error print menus at once.

Status Print Menu

The status print menu determines the changes in signal status that cause a printout to be generated. Figure 3-6 illustrates the status print auxiliary menu. The status print menu can be controlled individually or all at once. Individually the menu items can be enabled or disabled. Enabling an item from the status print menu causes a time- and date-stamped printout to be generated when that status event occurs.

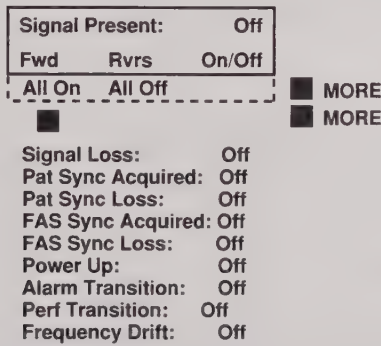


Figure 3-6
Status Print Auxiliary Menu

The following status print menus are displayed one at a time by repeatedly pressing the soft key below the Fwd (forward) or Rvrs (reverse) menu item:

Signal Present
Signal Loss
Pat Sync Acquired
Pat Sync Loss
FAS Sync Acquired

Printouts

FAS Sync Loss
Power Up
Alarm Transition
Perf. Transition
Frequency Drift

The three menu items on the bottom line are:

Fwd
Rvrs
On/Off

The Fwd soft key scrolls forward through the status print menus and pressing the Rvrs soft key scrolls backward through the status print menus. Pressing the On/Off soft key toggles the displayed status print menu from its present state to the opposite state.

The LED inside the More soft key illuminates indicating more than the three displayed menu item selections are available. Pressing the More soft key displays the final two menu selections:

AllOn
AllOff

Pressing the soft key below the **AllOn** or **AllOff** menu item, respectively enables or disables all of the status print menus at once.

3.5 MEMORY STORAGE PRINTS

Using the Memory Storage auxiliary menu, the INTERCEPTOR 1402 user may select either Memory Print or Histogram data storage and printout capabilities. Each of these capabilities has its own Auxiliary Menu and selection. This subsection describes the Memory Print Auxiliary Menu and the Histogram Print Auxiliary Menu.

3.5.1 Memory Print Auxiliary Menu

The user may select the Memory Print storage feature by setting the MEMORY STORE auxiliary menu to Memory. The Memory Print menu allows up to 24 printouts to be stored and then printed out at a later time. The Memory Print menu indicates the present status of the memory print and the percentage of available memory left for storing additional printouts. Pressing the soft key below the On/Off menu selection toggles the memory print between off and on. When memory print is set to On, pressing the CONTROLS or RESULTS printer switch stores the printout information in memory. The percent of available memory decreases from 100% to indicate the amount of memory left for storing printout information. When the percentage displayed is 0%, the printer buffer is full.

After printout information has been stored, a printer can be connected to the printer connector, determined by the print auxiliary menu. Pressing the soft key below the Print menu item, on the bottom line of the display window, prints out the stored printer information. After the stored information has been printed, pressing the soft key below the Clear menu item clears the memory location where the printout information is stored. Clearing the printer memory location causes the top line to again indicate that 100% of the print buffer is available for storing more printouts.

3.5.2 Histogram Print Auxiliary Menu

The histogram print auxiliary menus allow the user to store and time stamp events. The INTERCEPTOR 1402 stores all result-related events with one second resolution in non-volatile memory. The user may access the Histogram Print feature by setting the MEMORY STORE auxiliary function to HISTGRM in the AUXILIARY category. It is necessary to select Histogram Storage before performing any histogram set-up. Figure 3-7 shows the MEMORY STORE function.

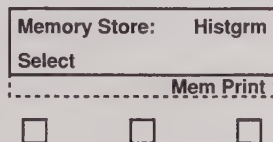


Figure 3-7
Selecting the Memory Storage Feature

3.5.3 Histogram Selections

The AUXILIARY menu includes five sets of Histogram selections. These are: Histogram Type, Histogram Buffer, Histogram Result, Histogram Length, and Histogram Start.

Histogram Type - This selection set determines the Histogram format. The parameters for the Histogram Type are: Graph, Text, and List.

Graph Uses graphics output for histogram graphs.

Text Outputs the histograms using the ASCII format.

List Prints out a complete list for histogram events. This format is a comma delimited list of counts, suitable for use by a remote computer.

Printouts

Histogram Buffer - This selection set displays the quantity of information stored. Choices here include On, Off, and Clear. Access these choices by pressing their corresponding soft keys.

- On Enables the entire buffer. When the buffer is enabled, the display will show %XX which shows the percentage of the buffer which has been used. The buffer has an average of 1000 events storage capacity.
- Off Closes out the buffer. The test being histogrammed continues to run while the buffer is closed out.
- Clear Erases the current data that is stored in the buffer. The histogram buffer is also cleared by a test restart or by recalling a program.

Histogram Result - This selection set has three soft keys: Print, Prev (Previous), and Next. The Print soft key signals the printer to generate a histogram printout of a specified result. If there is no data recorded for a specific period of time, the momentary message "No Such Event During Specified Time" is displayed. The Previous (Prev) soft key scrolls back to the previous result. The Next (Next) soft key scrolls forward to the next result in the circular list of results.

The result counts that are stored and available for histogram printouts are:

Signal Losses
Pattern Slips
Bit Errors
CRC Errors
REBEs

G.821 Results:

Unavailable Seconds
Errored Seconds
Severely Errored Seconds
Code Errors*
AIS Counts*
FAS Loss Counts*
CRC FAS Loss Counts
Remote Alarms*
FAS Errors*

M.550 Results:

Unavailable Time*
Errored Seconds*
Severely Errored Seconds*

* For all appropriate rates

An additional feature is the selection of printing ALL applicable result histograms. This selection is found within the Auxiliary menu function Histogram Type. It takes about 20 minutes to obtain a complete "All" printout, depending upon the type of information that is stored. In the case of applicable results that have no data stored, the printout shows the message "No Events Found in Specified Range."

Histogram Start - This selection sets the time to start a histogram graph, relative to the time the Histogram Buffer was switched on. The selected start time appears in the upper right corner of the display window; the selections Begin, Up and Down, and Help (press the MORE soft key for Help) appear in the lower half of the display window. Using the Histogram Start and Histogram Length choices allow the user to zoom into and out of the histogram data. See Figure 3-14 for a demonstration of the zooming feature.

Begin Resets the Histogram start time to the start of the test.

Up Advances each numerical value by an increment of one. Use the cursor keys to advance to the next number set.

Down Performs the opposite function of Up, it increments the numerical value backwards.

Histogram Length - This menu enables the user to select the length of the histogram being recorded. Pressing the Length soft key provides these choices: Auto, Up and Down, Help, and End.

Auto Sets the histogram length to the current end of test time.

Up Advances each numerical value by an increment of one. Use the cursor keys to advance to the next number set.

Down Performs the opposite function of Up, it increments the numerical value backwards.

Help Informs the user that the length is represented as day/hour:minute. The day is represented as 00-99, the minute and second as 00-59.

End Sets the length of the histogram to the current end of the test.

3.5.4 Generating a Histogram Print

The following is the procedure for generating a Histogram Print. The required equipment for this procedure are: the INTERCEPTOR 1402, appropriate cabling, and a printer.

1. Configure your printer to the INTERCEPTOR unit. See Section 3.2 and following to set baud rate, data bits and parity.
2. Connect your INTERCEPTOR to the system under test. See Section 1 of this manual for information on connecting and cabling the INTERCEPTOR.
3. Use the SETUP SELECT rocker switch to select AUXILIARY.
4. Scroll through the menu choices. Select Memory Store: Histogram.
5. Turn the Histogram Buffer on by pressing the On key.
6. Scroll SETUP SELECT to the right. Using the Prev or Next soft key, select the HistogramResult type to be printed.

Printouts

7. Program the Histogram Start time by using the Up or Down and Enter soft keys and the cursor.
8. Press **SETUP SELECT** and set the Histogram Length by pressing the Up and Down soft keys.
9. Press **SETUP SELECT** to print the specified histogram, and press the soft key under Print.
10. A momentary message appears on the display showing **Processing Histogram - Please Wait** and a printout will be generated.

Many Histogram Prints contain common information. This information consists of: Start of Acquisition, Start of Print, Duration of Print, Seconds Per Bar, and Last Second Bar all for individual results.

Table 3-8 depicts a typical Histogram Print, and some of the parameters common to all Histogram Prints.

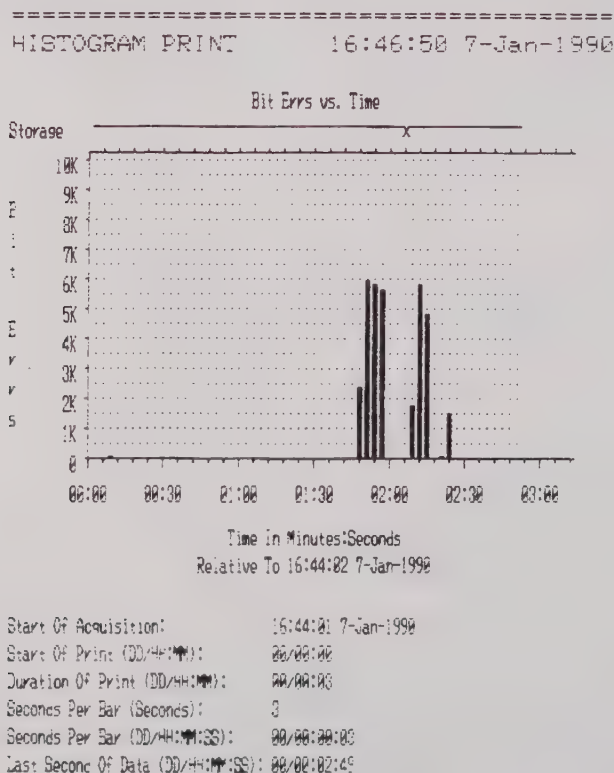


Figure 3-8
Typical Histogram Print

3.5.5 Clearing the Histogram Buffer

The Histogram Buffer may be cleared in three ways. These are:

- **Front Panel Test Restart Key:** The histogram Buffer clears whenever the Test Restart key is pressed. If the histograms are ON and the buffer contains any information, the Buffer indicates when it has been cleared.
- **Histogram Clear from Setup Menu:** When the clear ENTER soft key is pressed, the buffer automatically and unconditionally appears. No user reminder appears.
- **Recall Program:** When any program recall occurs, the buffer automatically clears.

3.5.6 Event Buffer Size

The average number of test seconds with events that can be stored for histogramming is 1000 event seconds. The INTERCEPTOR 1402 uses data compression to store the event second data, so the fewer events (errors) that occur during the test seconds, the more event seconds of data that can be stored.

A typical “worst case” would be multiple errors of all possible error types, accumulated simultaneously. During this worst case, the maximum number of event seconds that can be stored is 400. There is a more common test situation, in which only one or a few errors are encountered throughout the test, resulting in an event buffer size of 6000 event seconds or more.

Examples of Histogram Prints

Figures 3-9 through 3-12 depict Histogram Printouts of various tests, captured by the INTERCEPTOR 1402 using an external graphics printer.

1. Power Loss Transitions

Figure 3-9 depicts the INTERCEPTOR unit that has recorded code errors during the test. About 20 seconds into the test, power is lost. Power returns at about 1 minute, 10 seconds into the test. The power loss indicator (at the top of the graph) shows the period of the power failure.

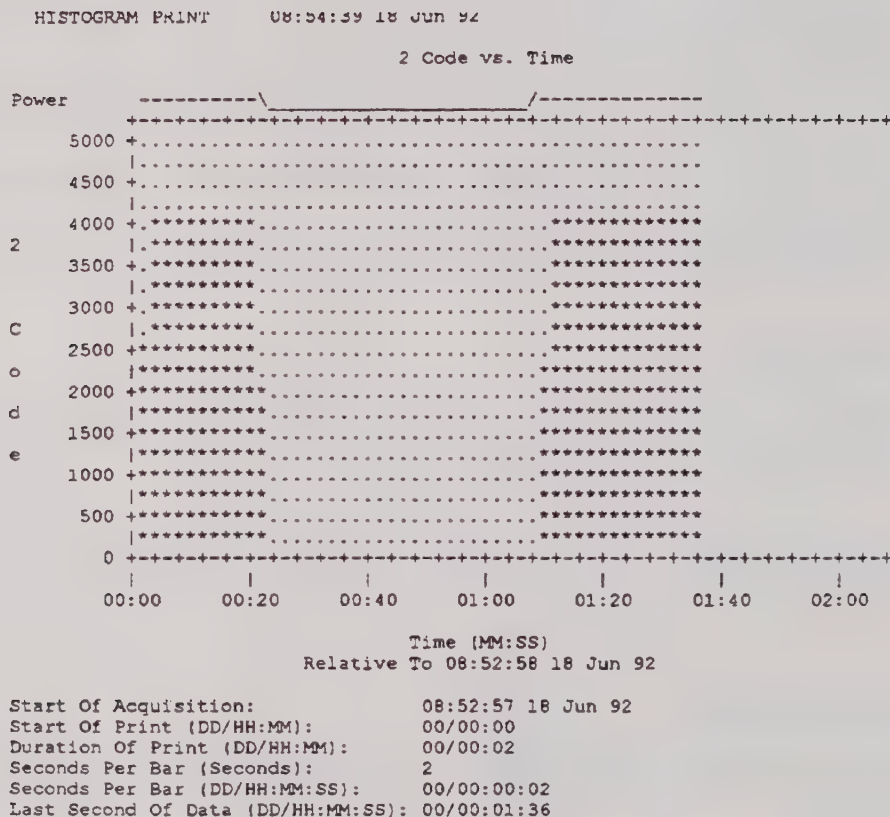


Figure 3-9
Power Loss Transition

2. Histogram Event Storage Transition

Figure 3-10 shows a bit error histogram test that ran for 1 minute and 5 seconds. About 20 seconds into the test, the user turned off the histogram buffer. Eight seconds later, the data collection (histogram buffer) was turned back on. Note the storage indicator line (above the graph) which clarifies the lack of data while the buffer was turned off.

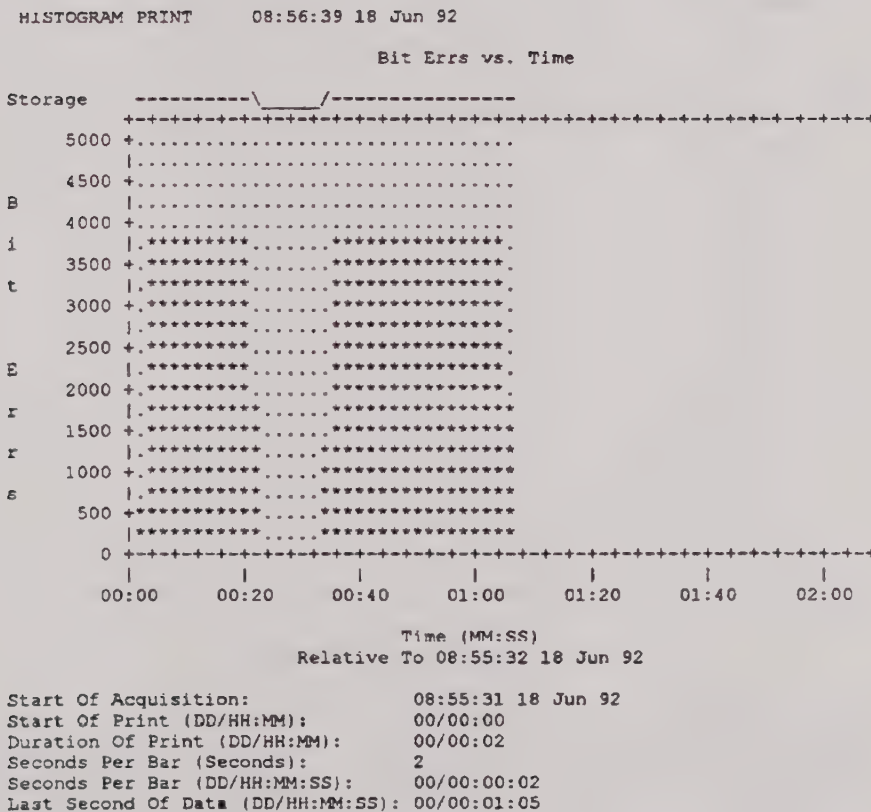


Figure 3-10
Histogram Event Storage Transition

3. Histogram Event Storage Transition with Power Transition

Figure 3-11 illustrates a combination of Figures 3-9 and 3-10. Power was lost for a short period, and the storage buffer was off for a short period. Since it is uncertain whether there were any power losses while the buffer was off, the characters '???' appear on the power line, for the time interval that data storage was not performed.

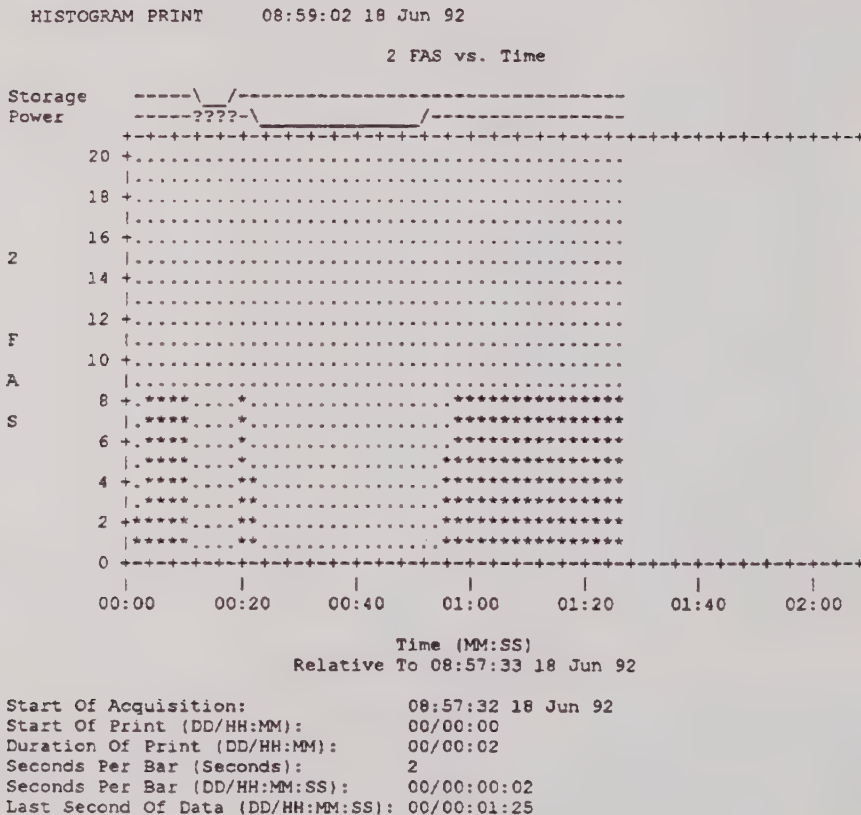
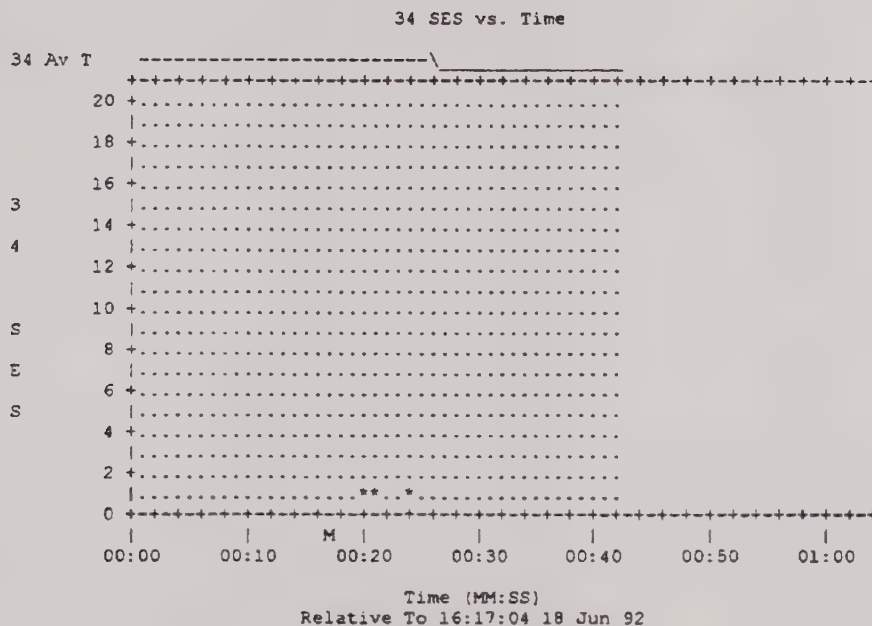


Figure 3-11
Histogram Event Storage Transition with Power Transition

4. Mode Change Transitions

Figure 3-12 illustrates that changing the test mode does not clear the Histogram data, and that data storage proceeds without interruption. The 'M' on the X-axis indicates (at time=17 seconds) the time of the mode change. Mode changes are defined as any changes to the test that cause a test restart (with the exception of changes that cause the histogram buffer to be cleared).



Start Of Acquisition: 16:17:03 18 Jun 92
 Start Of Print (DD/HH:MM): 00/00:00
 Duration Of Print (DD/HH:MM): 00/00:01
 Seconds Per Bar (Seconds): 1
 Seconds Per Bar (DD/HH:MM:SS): 00/00:00:01
 Last Second Of Data (DD/HH:MM:SS): 00/00:00:42

Figure 3-12
Mode Change Transitions

5. Unavailable/Available Time Transition

Figure 3-13 depicts the INTERCEPTOR 1402 encountering a test period with unavailable time. The unavailable time is indicated at the top of the graph, and shows the transition from available to unavailable time at the 20 second time interval. These transitions from available to unavailable time automatically appear on graphs of performance results whenever there is a transition to record.

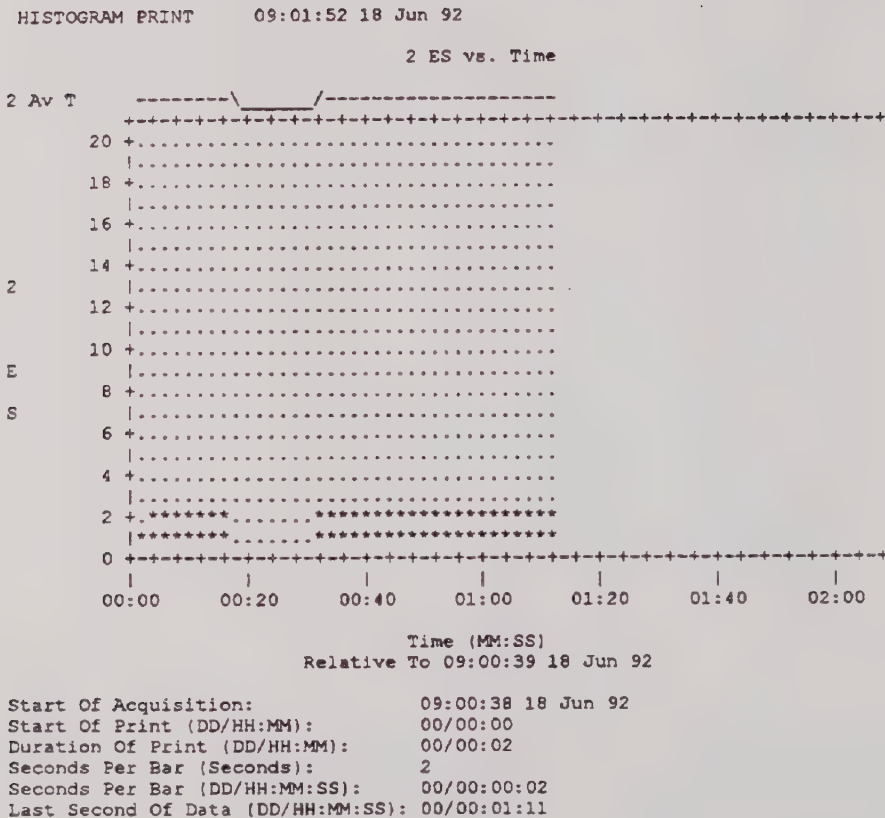
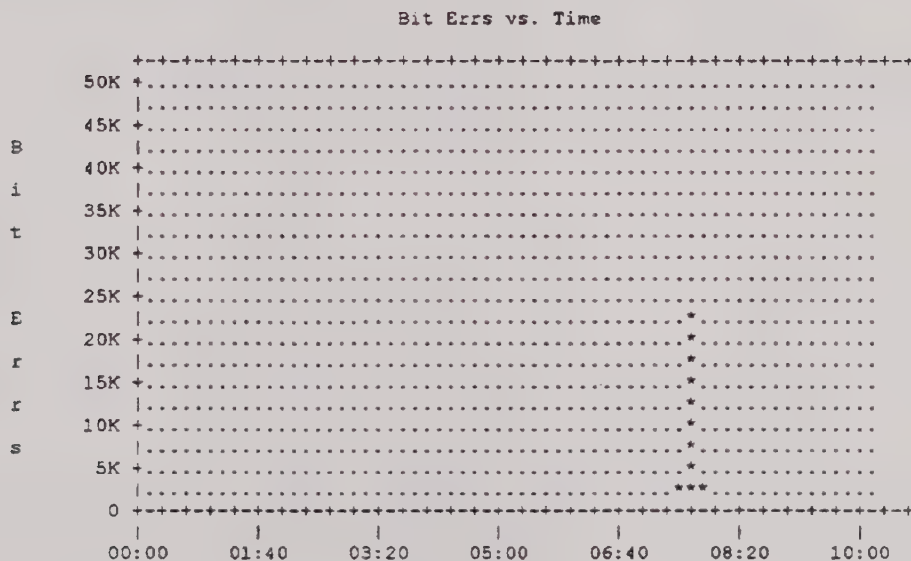


Figure 3-13
Unavailable Time Transition

6. Zooming Capabilities

Figure 3-14A illustrates a ten-minute test, in which a burst of errors is generated after seven minutes. The user can zoom in to see a smaller fraction of time, until the bit errors are isolated and resolved to one second granularity. Figure 3-14B shows the start time of 9:15:17 and time length of one minute to zoom in and show the burst of errors in greater detail.

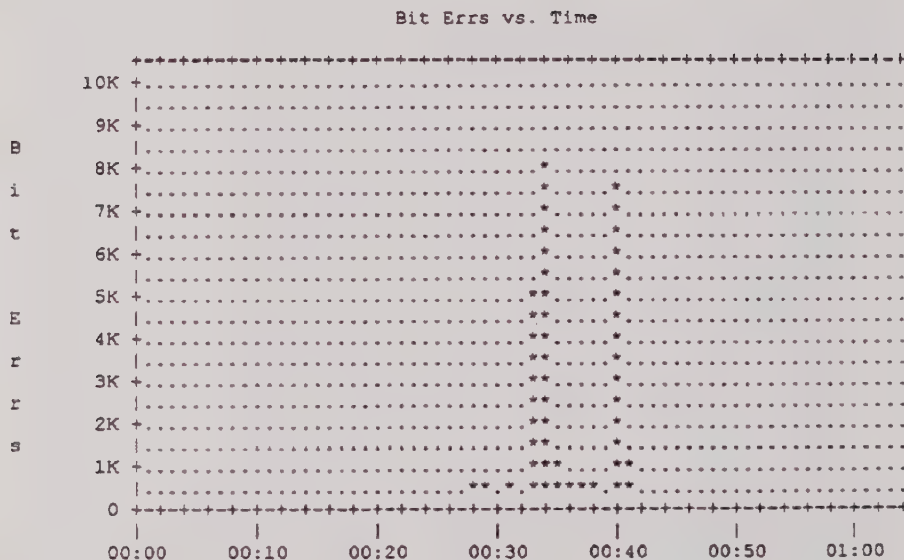
HISTOGRAM PRINT 09:18:19 18 Jun 92



Start Of Acquisition: 09:08:16 18 Jun 92
 Start Of Print (DD/HH:MM): 00/00:00
 Duration Of Print (DD/HH:MM): 00/00:10
 Seconds Per Bar (Seconds): 10
 Seconds Per Bar (DD/HH:MM:SS): 00/00:00:10
 Last Second Of Data (DD/HH:MM:SS): 00/00:10:01

Figure 3-14A
Zooming Capabilities

HISTOGRAM PRINT 09:20:53 18 Jun 92



Start Of Acquisition: 09:08:16 18 Jun 92
 Start Of Print (DD/HH:MM): 00/00:07
 Duration Of Print (DD/HH:MM): 00/00:01
 Seconds Per Bar (Seconds): 1
 Seconds Per Bar (DD/HH:MM:SS): 00/00:00:01
 Last Second Of Data (DD/HH:MM:SS): 00/00:12:36

Figure 3-14B
Zooming Capabilities

3.6 PR-55 LID PRINTER

The PR-55 Lid Printer Option easily attaches to the INTERCEPTOR 1402 to provide on-site printouts. This section describes basic operations for this printer.

3.6.1 PR-55 Lid Printer Operation

The PR-55 thermal dot-matrix printer replaces the front panel cover of the INTERCEPTOR. The printer attaches to the front panel by the hinge on the bottom of the unit. With the printer turned off, the lid printer can be closed, acting as the front cover for the INTERCEPTOR. The circular PRINTER connector located at the lower left on the front panel provides power, data, and control leads to the printer.

The PR-55 generates 40-character columns. Therefore, the column width of the 1402 should be set to 40 when using the PR-55. Asynchronous serial data is sent from the INTERCEPTOR to the printer at a rate of 9600 bits/second, 8 data bits, and no parity bit. The data rate, number of data bits, and parity bit can be set manually from the data format auxiliary menu (described previously) or automatically by selecting PR-55 from the same auxiliary menu.

3.6.2 PR-55 Controls and Indicators

Two control switches are located on the PR-55 Lid Printer. These control switches are the ON LINE switch and the PAPER FEED switch. The LED inside the ON LINE switch must be illuminated for the printer to produce a printout.

A printout is generated when the INTERCEPTOR is properly configured for the PR-55 printer, the PR-55 is on line, the print auxiliary menu printer driver menu item is set to RS232, and the CONTROLS or RESULTS switch is pressed.

Pressing the PR-55 ON LINE switch toggles the printer between on line and off line. When the PR-55 is off line, the LED inside the ON LINE switch is extinguished and no printout can be generated. When the printer is off line, pressing the PAPER FEED switch causes the printer paper to be advanced one line. Pressing the ON LINE switch again illuminates the LED in the ON LINE switch and disables the PAPER FEED switch. Note that the PAPER FEED switch only advances paper when the PR-55 is off line.

3.6.3 Loading Printer Paper

When the PR-55 Lid Printer is out of paper, a red LED inside the PAPER FEED switch illuminates. The PR-55 accepts a roll of thermal paper that measures 11.17 cm in length, 4.57 cm in diameter, with a 1.14 cm inside diameter. Table 3-2 describes the procedure for inserting a new roll of thermal paper into the lid printer.

Table 3-2
Loading Paper in the PR-55 Printer

Step:	Activity:
1.	Press the ON LINE switch to set the printer off line.
2.	Hold the edges of the transparent plastic cover, located above the empty paper roll, and slowly pull up on the edges to remove the plastic cover.
3.	Remove any remaining paper from the lid printer slot.
4.	Pull the small levers, located on each end of the empty paper roll, in the direction of the arrow on the levers to release the empty paper roll retaining rod.
5.	Remove the empty paper roll and the retaining rod from the printer.
6.	Slide the empty paper roll off the retaining rod and insert the retaining rod into the new roll of thermal paper. Remove the tape from the new paper roll and make sure that the end of the paper roll is a straight, even cut.
7.	Roll about 8 cm of paper from the roll, place the paper and retaining rod flat inside the lid printer (be sure the shiny side of the paper is facing down), and push the levers on each end of the paper roll to secure the rod and paper roll in the printer.
8.	Insert the end of the paper into the printer slot, located approximately 1.5 cm from the top of the printer cover.
9.	Press the PAPER FEED switch several times until the end of the paper roll extends through the slot in the printer. The paper roll can be turned by hand to roll any excess paper back onto the roll, taking the slack out of the paper.
10.	Replace the plastic cover above the paper roll. The lid printer can once again be set on line and printouts resumed.

3.7 USING OTHER RS-232 COMPATIBLE PRINTERS

The RS-232 Printer/Controller Interface allows the INTERCEPTOR to operate with many serial, RS-232 compatible printers. The RS-232/V.24 connector, connector pin assignments, printer set-up, and operation are described in the following sections.

3.7.1 Printer/Controller Interface Connector

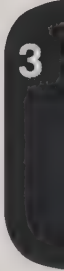
The RS-232 Printer/Controller Interface connector is located on the side panel. This connector is a 25-pin, D-type, female connector. Refer to Table 3-1 for the connector pin assignments.

3.7.2 Printer Set-up and Operation

Table 3-3 describes the procedures for setting up and operating a serial printer connected to the INTERCEPTOR.

Table 3-3
Serial Printer Set Up and Operation

Step:	Activity:
1.	Connect the serial printer to the INTERCEPTOR using the proper cable. When a cable is used to connect the printer to the side panel connector, ensure that the connector pins support the functions listed in Table 3-1.
2.	From the printer operating manual, determine the baud rate, number of data bits, the line termination, and the control leads that are used. Note that the INTERCEPTOR RS-232/V.24 Printer/Controller Interface is configured as Data Communications Equipment (DCE). The INTERCEPTOR transmits data as ASCII-coded information; in serial asynchronous format; with 1 start bit; 7 or 8 data bits; odd, even, or no parity bit; and 2 stop bits. One stop bit is expected on received data.
3.	Make sure that the baud rate, data bits, and parity bits of both the printer and INTERCEPTOR are configured the same so that information is reliably exchanged. Failure to do so results in unintelligible printouts. To verify the INTERCEPTOR set-up, press the SETUP CATEGORY switch to illuminate the LED next to the AUXILIARY label. Press the right arrow on the SETUP SELECT switch to scroll through the auxiliary menus. Auxiliary menus of particular interest for printer set-up are: Print - determines the printer driver and remote control. RS-232 -determines the baud rate, number of data bits, and parity bit. Printer - determines printer line width and termination.
4.	After the INTERCEPTOR is properly configured for the printer being used, turn the attached printer power on and set the printer on line.
5.	To ensure that the printer is connected and operating properly, press the CONTROLS switch, located on the INTERCEPTOR front panel. Make sure the information printed out is legible. If it is not legible, recheck the INTERCEPTOR auxiliary menu settings, the printer cabling, and printer settings to correct the fault.



3.8 USING IEEE-488 COMPATIBLE PRINTERS

With the optional IEEE-488 Printer/Controller Interface installed, the INTERCEPTOR is capable of operating an IEEE-488 compatible printer or of being controlled by an external controller. The following sections describe the connector, contact assignments, address selection, and printer operation.

3.8.1 IEEE-488 Printer/Controller Interface Connector

The optional IEEE-488 Printer/Controller Interface connector is located on the side panel. This connector is a 24-contact, D-type connector. Refer to Table 3-4 for the connector contact assignments. This interface complies with the IEEE Standard 488.2 Codes, Formats, Protocols, and Common Commands (ANSI/IEEE Std 488.2-1987).

Table 3-4
IEEE-488 Printer/Controller Interface Connector Contact Assignment

Contact No.:	Signal Line:	Contact No.:	Signal Line:
1	DIO1	13	DIO5
2	DIO2	14	DIO6
3	DIO3	15	DIO7
4	DIO4	16	DIO8
5	EOI	17	REN
6	DAV	18	Gnd for pin 6
7	NRFD	19	Gnd for pin 7
8	NDAC	20	Gnd for pin 8
9	IFC	21	Gnd for pin 9
10	SRQ	22	Gnd for pin 10
11	ATN	23	Gnd for pin 11
12	Shield	24	Gnd, Logic

3.8.2 IEEE-488 Mode Selection

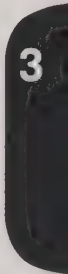
The Print menu item selection, found on the print auxiliary menu, determines the print driver and remote controller. Setting the Print or RC menu item to 488 respectively allows the INTERCEPTOR to operate an IEEE-488 printer or to be controlled by an IEEE-488 controller.

Setting the Print menu item to 488 sets the INTERCEPTOR to the talk-only mode. In the talk-only mode, the INTERCEPTOR sends all printer information to the IEEE-488 port and does not respond to IEEE-488 remote commands. Setting the RC menu item to 488 places the INTERCEPTOR in the addressable mode. In the addressable mode, the unit address can be set or verified to ensure that no two devices on the bus have the same address. The INTERCEPTOR address (00 to 30) is selectable through the IEEE 488 address auxiliary menu.

Selection of the IEEE-488 operating mode is accomplished through the print auxiliary menu. Table 3-5 describes the process for setting or verifying the IEEE-488 operating mode.

Table 3-5
IEEE-488 Set Up and Verification

Step:	Activity:
1.	Press the front panel SETUP CATEGORY switch to illuminate the LED next to the AUXILIARY label.
2.	Press the SETUP SELECT switch until the print auxiliary menu is visible in the display window.
3.	View the Print and RC (remote control) selection.
4.	Press the soft key below the Select menu item, on the bottom line of the display window to set Print to 488 to drive an IEEE-488 printer. Note that the Print and RC menu selections cannot be set for the same physical device at the same time.



SECTION 4 REMOTE CONTROL

4.1 INTRODUCTION

This section describes the RS-232 and IEEE-488/IEC625 Interfaces, remote control modes, remote control command syntax, and remote control commands and queries.

4.2 REMOTE CONTROL INTERFACES

The INTERCEPTOR can be remotely controlled using the RS-232 Interface connector or the optional IEEE-488 Interface connector and a suitable remote controller.

When in remote control, a suitable remote controller is able to fully control the INTERCEPTOR operation. While under remote control, printouts can be generated and the unit operating parameters changed or verified.

The term “remote controller device” is used when referring to dumb terminals, computers, or controllers. Any of these devices can be used to control the INTERCEPTOR 1402.

A controller typically provides non-interactive operation using the IEEE-488 interface or the RS-232 interface. A terminal typically provides interactive operation using the RS-232 Interface. A Personal Computer (PC) may provide interactive or automated operation on either the RS-232 or IEEE-488 Interface, depending on what kind of software the PC runs.

4.2.1 Remote Control Operation

The INTERCEPTOR can be remotely controlled by using either the serial RS-232 Printer/Controller Interface or the optional parallel IEEE-488 Printer/Controller Interface. The PRINT AUXILIARY menu determines the remote control selection. If the IEEE-488 option is not installed, the remote control choices are None or RS232; if the IEEE-488 option is installed, the remote control choices are None, RS232, or 488.

The device selected by the RC (remote control) menu item from the print auxiliary menu determines which controller interface is enabled. The INTERCEPTOR is placed in remote control mode by connecting a suitable controller to the selected controller interface, and sending a valid command.

To indicate that the INTERCEPTOR is under RS-232 remote control, the front panel displays the following message:

```
RS-232 Control  
Press ENTER to abort
```

Remote Control

Or when under IEEE-488 remote control, the message displayed is:

```
IEEE-488 Control
Press ENTER to abort
```

Pressing the **ENTER** switch (located below the **SETUP SELECT** switch) exits the remote control mode and returns the INTERCEPTOR to local control.

When in remote control, all front panel controls can be locked out by sending the local lockout (LLO) command. Please refer to the LLO command for more information.

4.2.2 Remote Control Modes

When under RS-232 remote control, the INTERCEPTOR can be operated in either an interactive (TERMINAL) mode or a non-interactive (COMPUTER) mode. In terminal mode, the INTERCEPTOR operates interactively with the remote controller device by providing a prompt character (>) when the INTERCEPTOR is ready to receive a command, echoing all characters back to the remote controller, and transmitting error response messages.

In the COMPUTER mode the INTERCEPTOR only provides an output to the controller in direct response to a query. The controller receives no other output. The COMPUTER mode allows the controller to concentrate on the commands being sent and the returned responses, without being interrupted by echoed statements or error messages. Note that TERMINAL mode operation is not supported via the IEEE-488 interface.

4.2.3 RS-232 Remote Control

The INTERCEPTOR can be remotely controlled using the RS-232 Printer/Controller Interface in either the TERMINAL mode or the COMPUTER mode. The procedures for setting the INTERCEPTOR to these two modes are as follows:

- 1. TERMINAL Mode

Table 4-1 describes the procedure for setting up and remotely controlling the INTERCEPTOR in the TERMINAL mode.

4

Table 4-1
Terminal Mode Set Up

Step:	Activity:
1.	Connect the remote controller cable to the INTERCEPTOR and turn the INTERCEPTOR and controller power on.
2.	Press the front panel SETUP CATEGORY switch to illuminate the LED next to the AUXILIARY label.

Table 4-1
Terminal Mode Set Up (Continued)

Step:	Activity:
3.	Press the SETUP SELECT switch to display the print auxiliary menu.
4.	With the print auxiliary menu displayed, press the softkey below the Select menu item to set Print to RS232 for RS-232 remote control.
5.	Make sure that the controller and INTERCEPTOR are configured for the same baud rate, parity bit, and data bits. Failure to do so results in unintelligible printouts. To verify the INTERCEPTOR setup, press the SETUP CATEGORY switch to illuminate the LED next to the AUXILIARY label. Press the right arrow on the SETUP SELECT switch to scroll through the auxiliary menus. Auxiliary menus of particular interest for controller set-up are: Print - determines the print driver and remote controller. RS-232 -determines the baud rate, number of data bits, and parity Printer - determines the printed line width and termination
6.	Sending an ASCII "Control C" sets the INTERCEPTOR to terminal mode.
7.	Observe the controller screen and verify the presence of the prompt character (>).
8.	This completes the INTERCEPTOR setup for RS-232 remote control operation. The remote controller can now communicate with the INTERCEPTOR and control its operation.

In TERMINAL mode the prompt, echo, and error message functions are enabled. When the prompt character (>) is displayed, the INTERCEPTOR is ready to accept another command or query. Editing of commands or queries may be performed by using the **BACKSPACE** key. Pressing the **ESC** (escape) key recalls a command or query. Once the command or query is typed properly, press the **ENTER** or **RETURN** key to execute that function. Each command or query must have the proper syntax and be properly terminated before the INTERCEPTOR accepts it as being valid. Refer to Subsection 4.3.1 for the proper syntax and valid terminators.

Terminate the TERMINAL mode by sending the LOCAL command or by pressing the **ENTER** switch on the INTERCEPTOR front panel.

2. COMPUTER Mode

To set the INTERCEPTOR for computer mode, perform the steps for setting it to terminal mode. Then send the following command:

SYSTEM:RC_MODE COMP

In COMPUTER mode a programmed computer can control the INTERCEPTOR. COMPUTER mode disables the prompt character (>), the echo, and command line editing. This allows the programmer to know that any data received is in response to a query. As with terminal mode, each command must have the proper syntax and valid terminator. If the INTERCEPTOR receives an invalid command or query, no error message is sent unless it is instructed to do so. Refer to the STATUS:ERROR? query found later in this section.

COMPUTER mode is terminated by either sending the LOCAL command or by pressing the **ENTER** switch on the INTERCEPTOR front panel.

3. Auto-Baud Selection

To help simplify the establishment of the RS-232 remote control connection, the INTERCEPTOR supports an auto-baud function. Auto-baud allows a remote user to automatically configure the INTERCEPTOR baud rate, data bits, and parity bit to match the remote controller device settings. Auto-baud can be used to set the INTERCEPTOR to TERMINAL or COMPUTER mode.

To initiate auto-baud, use the remote controller to perform the steps listed in Table 4-2.

Table 4-2
Initiating Auto-Baud

Step:	Activity:																
1.	Connect the remote controller cable to the INTERCEPTOR and turn the INTERCEPTOR and controller power on.																
2.	Press the front panel SETUP CATEGORY switch to illuminate the LED next to the AUXILIARY label.																
3.	Press the SETUP SELECT switch to display the print auxiliary menu.																
4.	With the print auxiliary menu displayed, press the softkey below the Select menu item to choose the desired print driver and remote control. Print menu selections are: <table><tr><td><u>Print</u></td><td><u>RC</u></td></tr><tr><td>None</td><td>None</td></tr><tr><td>None</td><td>RS232</td></tr><tr><td>None</td><td>488</td></tr><tr><td>RS232</td><td>None</td></tr><tr><td>RS232</td><td>488</td></tr><tr><td>488</td><td>None</td></tr><tr><td>488</td><td>RS232</td></tr></table>	<u>Print</u>	<u>RC</u>	None	None	None	RS232	None	488	RS232	None	RS232	488	488	None	488	RS232
<u>Print</u>	<u>RC</u>																
None	None																
None	RS232																
None	488																
RS232	None																
RS232	488																
488	None																
488	RS232																

Table 4-2
Initiating Auto-Baud (Continued)

Step:	Activity:
5.	Press the remote controller BREAK key two times, with a 1-second pause between keystrokes.
6.	Verify that AUTOBAUD IN PROGRESS is visible in the INTERCEPTOR results display window.
7.	Repeatedly press the SPACE BAR on the controller (or send 20 Hex) at a rate of 5 to 10 times a second for 10 seconds, or until the message Auto-baud achieved. Press <ESCAPE> to continue. is visible on the terminal display.
8.	Press the ESC (escape) key on the remote controller (1B Hex) and verify that Character format determined. is visible on the terminal display.

The INTERCEPTOR is now configured for terminal remote mode. To place the INTERCEPTOR in COMPUTER mode, send the following command:

SYSTEM:RC_MODE COMP

Disregard all characters received, until computer mode is reached.

When attempting to establish auto-baud, certain conditions may occur. The following information explains these conditions.

- If auto-baud is not achieved within 30 seconds of its initiation, the INTERCEPTOR aborts the auto-baud function and reverts to its previous RS-232 settings. This time-out condition is necessary since many terminals generate a BREAK when they are turned on or off and can accidentally cause the INTERCEPTOR to go into the auto-baud mode. When this occurs, the INTERCEPTOR, the message **AUTOBAUD IN PROGRESS** is visible in the results display window for 30 seconds, until the time out occurs to abort the auto-baud mode.
- Until the INTERCEPTOR determines the terminal character format, the message **Auto-baud achieved, Press <ESCAPE> to continue.** is always transmitted using a 7 data bit, 2 stop bit, and even parity bit format. Because of this, the message may not appear normal on terminals that are configured differently. For this reason, go ahead and send the ESCAPE (1B Hex) character to allow the INTERCEPTOR to determine the character format.

4.2.4 IEEE-488 Remote Control

Table 3-4 in this manual lists the IEEE-488 connector contact assignments. Table 4-3 lists the interface requirements supported by the INTERCEPTOR IEEE-488 Interface.

Remote Control

For the INTERCEPTOR to be remotely controlled using the IEEE-488 Printer/Controller Interface, the following two auxiliary menus must be set to properly support this remote operation.

- Print - determines the printer driver and remote controller.
- IEEE-488 address - determines the INTERCEPTOR address.

Table 4-4 describes the procedures for setting up and remotely controlling the INTERCEPTOR using parallel, synchronous data transmission via the IEEE-488 Printer/Controller Interface.

Table 4-3
IEEE-488 Interface Requirements Supported

Requirement:	Capability:	Definition:
Source Handshake	SH1	Complete capability
Acceptor Handshake	AH1	Complete capability
Talker	T5	Basic talker capabilities, serial poll, talk-only mode, unaddress if MLA (my listen address)
Listener	L4	Basic listener, unaddress if MLA
Service Request	SR1	Complete capability
Remote Local	RL1	Complete capability
Parallel Poll	PP1	Remote configuration
Device Clear	DC1	Complete capability
Device Trigger	DT1	Complete capability
Controller Interface	C0	No capability
Electrical Interface	E2	Three-state drivers

Table 4-4
IEEE-488 Set Up

Step:	Activity:
1.	Connect the remote controller cable to the INTERCEPTOR and turn the INTERCEPTOR and controller power on.
2.	Press the front panel SETUP CATEGORY switch to illuminate the LED next to the AUXILIARY label.
3.	Press the SETUP SELECT switch to display the print auxiliary menu.
4.	With the print auxiliary menu displayed, press the softkey below the Select menu item to select 488 for the RC (remote controller).

Table 4-4
IEEE-488 Set Up (Continued)

Step:	Activity:
5.	Press the SETUP SELECT switch until the IEEE-488 address auxiliary menu is visible in the display window.
6.	The current IEEE-488 address is displayed on the top line. Press the softkey below the Up or Down menu item, located on the bottom line of the display, to change the IEEE-488 address. IEEE-488 address selections are from 00 to 30. Make sure that the INTERCEPTOR address is not duplicated by any other device on the bus.
7.	Connect the INTERCEPTOR to the controller with a standard IEEE-488 cable.
8.	This completes the INTERCEPTOR setup for IEEE-488 remote control operation. The remote controller can now communicate with the INTERCEPTOR and control its operation.

4.2.5 IEEE-488 Interface Functions

The INTERCEPTOR 1402 IEEE-488 interface implements the following functions: SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, PP1, C0, and E2. This subsection describes these functions and some of the associated IEEE-488 bus level commands.

SH1 - Complete Source Handshake capability.

The INTERCEPTOR 1402 is fully capable of being a source of data on the IEEE-488 bus.

AH1 - Complete Acceptor Handshake capability.

The INTERCEPTOR 1402 is fully capable of accepting data and commands from the IEEE-488 bus.

T5 - Basic Talker capability with support for Serial Polling, Talk-only mode and Unaddress if MLA (My Listen Address).

The INTERCEPTOR 1402 may function as a Talker on the IEEE-488 bus. Additionally, it may be polled with the serial poll handshake. The INTERCEPTOR also functions as a Talk-Only device on a bus with no controller, when configured to print to the IEEE-488 interface. T5 capability implies that the INTERCEPTOR switches out of its Talker role if it is addressed to listen.

L4 - Basic Listener capability, Listen-only operation not supported, and Unaddress if MTA.

The INTERCEPTOR 1402 may function as a Listener on the IEEE-488 bus. It cannot, however, act as a Listen-only device on a bus with no controller. When the INTERCEPTOR is addressed to talk (MTA), it switches out of its Listener role.

Remote Control

SR1 - Complete Service Request capability.

The INTERCEPTOR may request service using the SRQ line of the IEEE-488 bus.

RL1 - Complete Remote/Local capability.

The INTERCEPTOR implements full Remote-Local transition capabilities including local lockout. This means that the INTERCEPTOR distinguishes between being controlled by its front panel and its IEEE-488 interface. When the INTERCEPTOR is powered up, it is in the LOCAL state (it is controlled by its front panel). When a command is sent to the INTERCEPTOR over the IEEE-488 bus, it transitions to the REMOTE state. In the REMOTE state, the INTERCEPTOR's front panel is disabled and the message "488 REMOTE CONTROL" is displayed. This message is accompanied by **<ENTER> TO ABORT** on the display. This means that the INTERCEPTOR's **ENTER** key may be pressed to put the instrument back in the LOCAL state and re-activate the front panel. To disable the return-to-local feature, send the LLO command to the INTERCEPTOR. After receiving the LLO command, the INTERCEPTOR no longer displays **<ENTER> TO ABORT** and the **ENTER** key no longer functions as a return-to-local feature.

DC1 - Complete Device Clear capability.

The INTERCEPTOR recognizes the Device Clear (DCL) and Selective Device Clear (SDC) bus commands and reacts to them according to the IEEE-488.2 Standard. These two commands have exactly the same effect on the INTERCEPTOR. Specifically, the Device Clear commands cause the INTERCEPTOR to clear its input and output queues, reset the command parser, clear the response formatter, and stop the execution of any pending commands. This guarantees that the INTERCEPTOR may accept new commands, execute them, and format responses to them without any interference resulting from previous error conditions. The Device Clear command specifically does NOT affect any of the INTERCEPTOR's settings. The Selective Device Clear command is a specific message to a unit performing a test.

DT1 - Complete Device Trigger capability.

The INTERCEPTOR recognizes the Group Execute Trigger (GET) command and reacts to it by executing a result clear. This result clear is exactly the same as that executed by the **RESULT: CLEAR** command as described later in this section. The execution of the Device Clear does not occur until all previously received commands have been executed. There will always be a moment between receiving the GET command and clearing the results.

PP1 - Parallel Poll with Remote Configuration capability.

The INTERCEPTOR can be configured and enabled to participate in Parallel Poll operations. This means that the INTERCEPTOR recognizes the IEEE-488 Parallel Poll Configure (PPC) and Parallel Poll Enable (PPE) bus commands to assert its SRQ value during a Parallel Poll. Note that the response to a Parallel Poll operation is determined by an internal status bit called Individual Status (ist). This is more fully described in section 4.2.6, item 2, of this manual.

C0 - No controller capability.

The INTERCEPTOR does not assert ATN (Attention) or attempt to act as a bus controller.

E2 - Three state drivers are used where applicable.

4.2.6 Serial and Parallel Polling with the INTERCEPTOR 1402

The above information explains which subsets of the IEEE-488 specification are implemented in the INTERCEPTOR 1402. Although that information explains many aspects of the INTERCEPTOR's operation (e.g. Remote/Local capabilities), other aspects, such as the Serial Poll and Parallel Poll features of the INTERCEPTOR, exhibit some device-specific behaviors. The following paragraphs provide in-depth discussions of the INTERCEPTOR's Serial Poll and Parallel Poll capabilities.

1. Service Requests and Serial Polling the INTERCEPTOR 1402

The Serial Poll operation of the IEEE-488 bus reads the INTERCEPTOR's IEEE-488 Interface's Status Byte. The bits of this byte are defined the same as the Status Byte Register defined in Section 4.5.3 of this manual. There is a subtle distinction, however, between the value read by a serial poll and the value read by the ***STB?** query. The difference concerns bit 6 of the status byte and it affects the way the INTERCEPTOR requests service. Ultimately, the difference between serial polls and ***STB?** is due to the fact that there are two status bytes — one, the Status Byte Register, is read by ***STB?** and the other, the IEEE-488 Interface Status Byte, is read by a serial poll. The two status bytes are closely related.

The Status Byte Register is set according to the Status Reporting registers which are described in Section 4.5 of this manual. Read this value at any time by using the ***STB?** query. Whenever the value of the Status Byte Register changes, its new value is written to the IEEE-488 Interface Status Byte. Hence, the two status bytes generally contain the same value. If bit 6 of the Status Byte Register, Master Status Summary (MSS), becomes set, the value written to the IEEE-488 Interface Status Byte will have bit 6, Request for Service (RSV) set high. RSV has a slightly different meaning than MSS, however. Setting RSV causes the Service Request (SRQ) line of the IEEE-488 bus to become set. Now if the controller Serial Polls the INTERCEPTOR it will see the RSV bit set but this Serial Poll will also clear the RSV bit so that subsequent Serial Polls will see RSV as zero. It is possible for serial polls to read RSV = 0 while the ***STB?** query sees MSS = 1.

We can now carry this scenario one step further to point out another subtlety of having two status bytes. If the Status Byte Register changes its value at this point, say bit 2 changes from 1 to 0, the new Status Byte Register value copies into the IEEE-488 Interface Status Byte. This means that the RSV bit of the IEEE-488 Interface Status Byte is going to be set to 1 again (remember that MSS has been 1 all along) and the INTERCEPTOR asserts SRQ and requests service again. This request for service is not a new request for service, but a repetition of the previous request for service caused by a change to the Status Byte Register. The INTERCEPTOR should not issue this service request, but unfortunately this is not possible using the INTERCEPTOR's IEEE-488 Interface Circuit. The Automated Test Programmer should be aware, then, that it is possible to receive multiple service requests because of a single need for service. Therefore, some requests for service should be ignored because they have already been received.

2. Parallel Polling the INTERCEPTOR 1402

The INTERCEPTOR 1402 implements the PP1 function of the IEEE-488 standard. This means that the INTERCEPTOR participates in Parallel Polls. The Parallel Poll operation was not entirely defined in the original IEEE-488 specification: it left a message called Individual Status (ist) to be defined by the device and the device-dependent nature of the Parallel Poll caused it to be seldom used. The IEEE-488.2 Specification, Rev G. with which the INTERCEPTOR complies, defines the ist message further so it is now possible to describe the Parallel Poll operation completely within the scope of IEEE-488.2.

Remote Control

The Parallel Poll operation consists of several steps. First each device which participates in Parallel Polls must be enabled through two bus commands, PPC and PPE. After the instruments have been configured and enabled, the controller can invoke the Parallel Poll and each enabled device will assert a DIO line. The controller then reads the value of the DIO lines, thus learning the status of up to eight different devices.

The first of these commands, PPC, is sent to an instrument or set of instruments. Only instruments addressed to Listen accept the PPC command. The PPC command “primes” these devices to accept the PPE command. If any command other than PPE is sent following the PPC command, the PPC command will be undone. So after issuing the PPC command, the PPE command enables these devices to respond to parallel polls.

The PPE command contains two pieces of information that the devices use: an assignment of the DIO line on which to respond, and a sense indication that the device uses to determine whether it will actively assert its response to parallel polls. The DIO line assignment is easy to understand — each instrument must be told on which DIO line to respond, so that each instrument responds on a unique line. Several devices can be assigned the same DIO line but this defeats the purpose of the Parallel Poll.

The IEEE-488 standard states that only those devices whose ist message matches the sense bit of the PPE can actively assert a response to a parallel poll. Prior to the IEEE-488.2 Specification, however, there was no definition of the ist message. One common way to handle ist, then, was to let ist be always equal to the RSV bit. This way, the sense of parallel polls would always be 1 and those devices with their RSV bits set, would assert a 1 on their assigned DIO lines. With the IEEE-488.2 Specification, however, we now have a way of defining an ist message which allows the user more flexibility than the ist = RSV method. See ***PRE** and ***IST?** in Section 4.4.1 of this manual. A parallel poll with sense = 1 causes those devices with their ist message set to 1 to assert a 1 on their assigned DIO lines.

The following steps must be taken to set up the INTERCEPTOR for Parallel Polling.

1. Use the ***PRE** command to determine how the ist message is set based on the Status Byte Register.
2. Address the INTERCEPTOR to Listen and send it the PPC command.
3. Immediately issue the PPE command telling the INTERCEPTOR which DIO line to respond on and when to assert a response. The INTERCEPTOR asserts a response when its ist message equals the sense bit of the PPE command.
4. Perform a Parallel Poll. If the INTERCEPTOR's ist matches the sense it was given, it asserts a one on the DIO line it was given.

As an example of this, use the parallel poll and have bit 2 of the parallel poll value tell us that the INTERCEPTOR has a response to be read or has an error message in its error buffer. We would use the command ***PRE 17** to cause the INTERCEPTOR's ist message to become set whenever bit 0 or bit 4 of its Status Byte Register are set. Then we would use PPC and PPE as described above making sure to encode in the PPE command that the sense of the INTERCEPTOR's response is 1 and its assigned DIO line is line 2. Now when we issue a parallel poll, bit 2 of the response indicates that the INTERCEPTOR ist message is 1 and, therefore, it has a response to be read or it has an error message in its error buffer.

Here is another example illustrating how the ***PRE** command can be used to have the INTERCEPTOR respond to parallel polls in a more conventional way. The command ***PRE 64** can be issued to the INTERCEPTOR. This causes it to set its ist message whenever its MSS bit is set to 1. Remember that the MSS bit is equivalent to the RSV bit which used as the value of the ist message. Now the PPC and PPE commands can be sent to the INTERCEPTOR, again using sense = 1 and any appropriate DIO line assignment. This causes the INTERCEPTOR to respond to Parallel Polls with a 1 if its MSS bit is 1 and 0 if its MSS bit is 0.

4.3 REMOTE CONTROL COMMANDS AND QUERIES

Once configured for remote control, the INTERCEPTOR is placed in the remote control mode when a valid remote command or query is received. A command is a statement sent from the controller that causes a change in the INTERCEPTOR. A query is a statement, ending with a question mark (?), from the controller that requests information from the INTERCEPTOR. The following subsections describe the syntax used, and valid remote commands and queries.

4.3.1 Remote Control Syntax

The INTERCEPTOR 1402 supports common commands (commands preceded by an *****) that are recognized by all devices adhering to the IEEE-488.2-1987 standard.

The general syntax format for both commands and queries is: the command name, followed by a colon, and followed by a subcommand. Note that the underscore (5F Hex) is required in the subcommand to prevent a syntax error. Refer to Subsection 4.6 for a list of remote errors and their causes.

The following is an example of a typical command sent to the INTERCEPTOR:

mode:2m:framing on[LF]

This example illustrates several common features of commands. Most commands are built up of pieces called “command elements” (mode, 2m, and framing) separated by colons (:). Most commands also accept one parameter which is separated from the command itself by one or more spaces. Some commands do not require a parameter, and some require two or more, in which case a comma (,) is used to delineate the parameters. A valid terminator follows a command (the terminator is indicated here as **[LF]** indicating the linefeed character) which indicates the end of the command.

The following is an example of a query:

result:bit_errs?[LF]

A query resembles a command. The main difference between a command and a query is that a query always ends with a question mark. Like commands, queries sometimes require parameters. These parameters come after the question mark, preceded by one or more spaces and separated from each other with commas. A query must also be terminated, by a **[LF]** in this case. The INTERCEPTOR always responds to a query by sending a response message back to the controller.

Remote Control

The following is an example of a response message:

5[LF]

This response indicates that the unit detected five bit errors. Notice that the response is terminated with a linefeed.

It is possible to group several commands and/or queries into one “Program Message” using only one terminator, to terminate the Program Message. The individual commands and queries are separated from each other by semi-colons when multiple commands are sent.

The following example depicts three commands followed by two queries:

mode:2m:framing on; mode:2m:ts16 on; mode:2m:crc4 on; result:bit_errs?; result:crc_errs?[LF]

The INTERCEPTOR 1402 responds to this Program Message by executing the three commands and then sends the responses to both queries as a single “Response Message”. The two responses are separated from each other with semi-colons so the response reads like this:

5;1[LF]

indicating that 5 bit errors and 1 CRC error was detected. Notice that the Response Message, like Program Messages, is terminated.

When several commands are grouped into a single Program Message, it is possible to abbreviate commands that have the same prefix as the previous command. This is how the earlier example could be abbreviated:

mode:2m:framing on; ts16 on; crc4 on; result:bit_errs?; crc_errs?[LF]

Notice here that the phrase “mode:2m:” was removed in two places and the phrase “result:” was removed from one place. Whenever the unit sees a partial command, it uses the prefix of the previous command to determine what the full command would have been. Notice also that the first command of the Program Message could not have been shortened — it *must* always be a complete command.

A few words about terminators. Every Program Message sent to the INTERCEPTOR must end with a terminator character. The terminator characters that the INTERCEPTOR 1402 recognizes depend on the type of interface and remote control mode being used. When using an IEEE-488 bus, the IEEE-488.2 standard sites three ways of terminating a Program Message: the linefeed character (ASCII 10), an EOI signal accompanying the last byte of the Program Message, or a linefeed character (ASCII 10) accompanied by the EOI signal. When using the RS-232 interface, the choice of terminators depends on the remote control mode. In COMPUTER mode, the unit only accepts the linefeed character (ASCII 10) as a terminator. This is for compatibility with IEEE-488 mode. In terminal mode, however, linefeed is fairly inconvenient so in addition to linefeed, carriage return (ASCII 13), or Carriage Return Line Feed (ASCII 13 followed by ASCII 10) are accepted.

In addition to receiving terminators, the INTERCEPTOR also puts a terminator character on the response messages it generates. When using the IEEE-488 bus, the terminator character is linefeed (ASCII 10) with the EOI signal set. When using RS-232 in computer mode, the terminator character is also a linefeed (ASCII 10). Finally, when using RS-232 in terminal mode, the terminator character is Carriage Return Line Feed (ASCII 13 is followed by ASCII 10).

Commands and/or queries are divided into nine groups. Commands and queries in each group are listed alphabetically and described in the following subsections. Examples are provided for most of the commands and queries.

All examples shown in this section use the **TERMINAL** mode format with printouts printed in a 40-character width. The commands are shown in upper-case characters although they may be entered in either upper-case or lower-case characters.

Each remote control command is associated with a command group. At the beginning of each command group is a table listing the associated commands and queries.

INTERCEPTOR command groups are:

COMMON COMMANDS: Commands and queries specified in ANSI/IEEE-488.2-1987 that are common to all instruments.

ERROR INSERT COMMANDS: Control the insertion of frame, logic, and code errors into the data stream.

MODE COMMANDS: Set up the operating mode and configure the INTERCEPTOR mode-dependent features before running a test.

PATTERN COMMANDS: Select the data pattern the INTERCEPTOR uses in testing.

PRINT COMMANDS: Control the INTERCEPTOR printer.

RESULT COMMANDS: Retrieve results from the INTERCEPTOR during a test and control features of the INTERCEPTOR which affect results.

STATUS COMMANDS: Set and read the status reporting registers, queues, and buffers.

SYSTEM COMMANDS: Used for INTERCEPTOR system-level operations.

TOP LEVEL COMMANDS: Functions of the INTERCEPTOR which are not grouped with any other commands.

4.4 REMOTE CONTROL COMMANDS

This section presents all of the remote control commands in their associated group and in alphabetical order. Each command and/or query includes an explanation, references to associated commands, and a brief example of its use. This section uses bold type to indicate the command/query format, as well as the variables to be used. Each command is listed first, followed by its meaning and whether is a command only, query only, or command and query.

4.4.1 COMMON COMMANDS

Certain remote control commands are considered to be common commands. Common commands and queries are preceded by an asterisk (*) and are supported by all devices adhering to the IEEE-488.2-1987 Standard.

The IEEE-488.2 COMMON commands and queries supported by the INTERCEPTOR are:

command:	query:
*CLS	
*ESE	*ESE?
	*ESR?
	*IDN?
	*IST?
	*LRN?
*OPC	*OPC?
	*OPT?
*PRE	*PRE?
*PSC	*PSC?
*RCL n	
*RST	
*SAV n	
*SRE	*SRE?
	*STB?
*TRG	
	*TST?
*WAI	

*CLS

Clear Status

command only

The ***CLS** command clears the status data structures, including the device defined Print Queue and the Error Buffer. The ***CLS** command does not clear the Output Queue if it is part of a program message containing a query. This means the Message Available (MAV) bit of the Status Register may not be cleared. For information on Status Reporting see Subsection 4.5.

Example:

- >***CLS** Clears all status register, queues, and buffers.
- >***ESR?** Reads the Standard Event Status Register.
- 0 Status Registers cleared.

***ESE**

Event Status Enable

command/query

The ***ESE** command sets the Standard Event Status Enable Register bits. The value of the bits in the Standard Event Status Enable Register determines which bits in that Register are enabled. When a bit of the Standard Event Status Register and its corresponding enable bit are set, the Event Status bit 5 (ESB) of the Status Register is also set. For additional information see commands ***ESR**, ***STB**, and Subsection 4.5, Status Reporting.

The ***ESE?** query requests the current contents of the enable register. When the Standard Event Status Register is read, the value returned is the bit weight of all the set bits at the time the byte was read. Refer to Table 4-5 for information on the bits in the Standard Event Status Enable Register.

Table 4-5
Standard Event Status Enable Register

Bit:	Weight:	Enables:
7	128	PON - Power On
6	64	URQ - User Request
5	32	CME - Command Error
4	16	EXE - Execution Error
3	8	DDE - Device Dependent Error
2	4	QYE - Query Error
1	2	RQC - Request Control
0	1	OPC - Operation Complete

Example:

>***ESE 32** Enables bit 5 (Command Error) of the Standard Event Status Enable Register.

>***ESE?** Reads back the Standard Event Status Enable Register.
32

***ESR**

Event Status Register

query only

The ***ESR?** query requests the contents of the Standard Event Status Register. This register is cleared after reading it. When you read the Standard Event Status Register, the value returned is the weight of all bits that are set at the time you read the byte. Refer to Tables 4-5 and 4-6 for information on each bit in the Standard Event Status Register.

For additional information see commands ***SRE**, ***OPC**, and Subsection 4.5, Status Reporting.

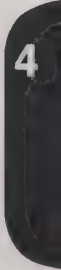


Table 4-6
Standard Event Status Register

Bit:	Weight:	Bit Name:	Condition:
7	128	PON	0 = Not powered on since last reading of register 1 = Powered-on since last reading of register
6	64	URQ	Not defined. Always zero
5	32	CME	Set to one when a Command error occurs
4	16	EXE	Set to one when an Execution error occurs
3	8	DDE	Not defined. Always zero
2	4	QYE	Set to one when a Query error occurs
1	2	RQC	Request control. Not used. Always zero
0	1	OPC	Set to one when a program message containing the *OPC command has been executed

Example:

>*ESR? Requests the Event Status Register status.
32 Response indicates that a Command Error occurred.

*IDN

Identification Query query only

The *IDN? query requests device identification information from the INTERCEPTOR. The INTERCEPTOR returns the following information: manufacturer, model, serial number (always 0), and software revision.

The *IDN? query must be the last query of a program message. Queries following *IDN? in a program message are ignored.

Example:

>*IDN? Requests the INTERCEPTOR identification information.
Telecommunications Techniques Corporation, INTERCEPTOR 1402, 0, 1.0

*IST

Individual Status query only

The *IST? query requests the Individual Status Message (ist). The Individual Status Message determines how the INTERCEPTOR responds to a parallel poll.

When the controller issues a Parallel Poll Enable, it sends a sense bit. The INTERCEPTOR then responds to Parallel Polls only when the *ist* value matches the sense of the Parallel Poll. The value of the *ist* message is determined by the Status Byte Register and the Parallel Poll Enable Register. For additional information see commands ***PRE**, ***STB**, and Subsection 4.5, Status Reporting.

Example:

>*IST? Requests the Individual Status Message.
0

NOTE: Responses to these queries will necessarily change as software is upgraded and revised, and new features are added to the INTERCEPTOR.

***LRN**

Learn Device Setup

query only

The ***LRN?** query requests the INTERCEPTOR's current test setup. The response from this query is a series of commands that are sent to the INTERCEPTOR at some later time to restore it to its present setup.

Example:

>*LRN? Request the INTERCEPTOR configuration information.
mode 2m;
mode:2m:framing ON; ts16 OFF; crc4 OFF; ais OFF; fas_dis OFF;
mode:2m:mfas_dis OFF; nfas "11011111"; nat_bit 1; coding HDB3; format COAX;
mode 8m;
mode:8m:framing ON; ais OFF; remote OFF; coding HDB3;
mode 34m;
mode:34m:framing ON; ais OFF; remote OFF; coding HDB3;
mode mux;
mode:mux:coding HDB3; coding_140 CMI;
mode:mux:2m:format COAX; framing ON; ts16 OFF; crc4 OFF;
mode:mux:2m:ais OFF; fas_dis OFF; mfas_dis OFF; nfas "11011111"; nat_bit 1;
mode:mux:8m:framing ON; ais OFF; remote OFF;
mode:mux:34m:framing ON; ais OFF; remote OFF;
mode:mux:input 34M; analysis 2M; output 34M;
mode:mux:demux_34:trib 1; demux_8:trib 1;
mode:mux:mux_34:trib 1; fill ONES; mux_8:trib 1; fill ONES;
mode 2M;
system:mem_print OFF; rc_print OFF;
system:perf:g821;
system:perf:cust:anom bit,ON;

Remote Control

```
system:perf:cust:anom fas,ON;
system:perf:cust:anom code,ON;
system:perf:cust:anom crc,ON;
system:perf:cust:anom rebe,ON;
system:perf:cust:anom ais,ON;
system:perf:cust:def sig_loss,ON;
system:perf:cust:def fas_sync,ON;
system:perf:cust:def alarm,ON;
system:perf:cust:def pat_sync,ON;
system:perf:cust:thresh:ses 2_fas,28
system:perf:cust:thresh:ses 2_code,2048
system:perf:cust:thresh:ses 2_crc,830
system:perf:cust:thresh:ses 2_rebe,830
system:perf:cust:thresh:ses 8_fas,99
system:perf:cust:thresh:ses 8_code,8448
system:perf:cust:thresh:ses 34_fas,232
system:perf:cust:thresh:ses 34_code,34368
system:perf:cust:thresh:ses 140_fas,568
system:perf:cust:thresh:ses 2_fas,208896
system:lang ENGLISH
err_ins:frame OFF; err_ins:frame:rate 1.0E-3; adj 1;
err_ins:logic OFF; err_ins:logic:rate 1.0E-3;
err_ins:code OFF; err_ins:code:rate 1.0E-3;
self_loop ON; timing INT;
rcv_input TERM; rcv_input:mon:34 RES; out_level 0;
pattern:program "111111100000000000000000"; pattern 2^15-1;
print:enable OFF; width 40; term CRLF;
print:status:sig_loss OFF; sig_pres OFF; pat_sync OFF; pat_loss OFF;
print:status:fas_sync OFF; fas_loss OFF; alarm OFF; power_up OFF; g821 OFF;
print:error:bit OFF; fas OFF; crc OFF; pat_slip OFF; prw_loss OFF;
print:type STD;
result:display>window1 2_CODE; window2 2_CODE;
result:resync_slip ON;
result:restart;
```

*OPC

Operation Complete

command/query

The ***OPC** command causes the INTERCEPTOR to set the Operation Complete (OPC) bit 1 of the Standard Event Status Register. This bit is set when all pending device operations have been completed.

The ***OPC?** query responds with an ASCII “1” in the output queue when all pending device operations have been completed.

Example:

>MODE 8M; *OPC Set the OPC bit 1 in the Standard Event Status Register after 8M mode has been established.

>MODE 8M; *OPC? Responds with a 1 after 8M mode has been established.

1

***OPT**

Option Identification

query only

The ***OPT?** query requests which options are installed in the INTERCEPTOR. A zero represents an option that is not installed. An installed option is represented by its name.

Table 4-7
Option Identification

Name:	Meaning:
IEEE488	An IEEE-488 interface has been installed.
140M	The 140M option card has been installed.
Nx64k	The Nx64k option card has been installed.

NOTE: Because new options and capabilities are constantly being developed, the number of elements of this response will almost certainly change in future software versions. However, the order and position of the currently defined options will not change.

Example:

>*OPT?

Request the options installed in the INTERCEPTOR 1402 (such as IEEE488, 140M, 0).

This response indicates that the unit has an IEEE-488 option and a 140M option. A zero in the third field indicates that no Nx64k option is installed.

*PRE

Parallel Poll Enable

command/query

The ***PRE** command sets the Parallel Poll Enable Register bits. The value of the bits in the Parallel Poll Enable Register determines which bits of the Status Byte set the Individual Status (ist) message. The ist message is set whenever there is a bit set in the Parallel Poll Enable Register, and the corresponding bit of the Status Byte Register is also set. The ist message is used when determining the response to a Parallel Poll. For additional information see commands ***STB**, ***ist**, and Subsection 4.5, Status Reporting.

The ***PRE?** query requests the current contents of the Parallel Poll Enable Register. When the Parallel Poll Enable Register is read, the value returned is the weight of all bits set at the time the byte was read. Refer to Table 4-8 for information on each bit in the Parallel Poll Enable Register.

Table 4-8
Parallel Poll Enable Register

Bit:	Weight:	Enables this bit of Status Byte to set ist:
7	128	Not Defined
6	64	MSS - Master Status Summary
5	32	ESB - Event Status Bit
4	16	MAV - Message Available
3	8	Not Defined
2	4	TSS - Test Status Summary
1	2	PAV - Print Available
0	1	EAV - Error Available

Example:

- >*PRE 16
- Enables MAV to set ist.
- >*PRE?
- 16
- Reads current value of the Parallel Poll Enable Register.
The INTERCEPTOR responds with the current value of that register.

PSC*Power-On Status Clear****command/query**

The ***PSC** command sets the power-on status clear bit setting of the INTERCEPTOR. When set to one, the INTERCEPTOR automatically clears all of the Status Enable Registers when powered ON. This prevents the INTERCEPTOR from generating a service request when it is powered ON. When set to zero, the INTERCEPTOR does not clear the enable registers when powered ON.

The ***PSC?** query requests the current power-on status clear setting.

Example:

>*PSC 0 Preserves the Status Enable Registers through a power cycle.

>*PSC? Requests the current value of the power-on status clear setting.
0

RCL n*Recall Stored Test Set Ups****command only**

The ***RCL n** command causes the INTERCEPTOR to recall a stored test set-up. This command is the same as the RECALL feature on the front panel. Unlike the front panel RECALL, however, the remote control and printer device selections are not changed nor are the RS-232 settings and the IEEE-488 address changed. This ensures that remote control operation can continue after the ***RCL** command is issued. Valid program numbers are 0 to 9.

Example:

>*RCL 3 Recalls stored test set-up number 3.

RST*Reset command only**

The ***RST** command sets the INTERCEPTOR to the factory default settings. Refer to Appendix C for a list of factory default settings.

Example:

>*RST Sets the INTERCEPTOR to the factory default settings.

*SAV n

Save command only

The ***SAV n** command causes the INTERCEPTOR to save a test set-up. Valid programmed test set-up numbers (n) are 0 to 9. This command is similar to the STORE function on the front panel.

>***SAV 3** Save a current test set-up as number 3.

*SRE

Service Request Enable command/query

The ***SRE** command sets the Service Request Enable Register bits. The value of the bits in the Service Request Enable Register determines which bits in the Service Request Register are to be enabled. When a bit of the Service Request Register and its corresponding enable bit are set, the Master Summary Status (MSS) bit 6 of the Status Register is also set. The Master Summary Status bit represents the summary of all the status registers, queues, and buffers. When this bit is set to 1, a service request (SRQ) is signalled by the INTERCEPTOR when operating in IEEE-488. For additional information see command ***STB**, and Subsection 4.5, Status Reporting.

The ***SRE?** query responds with the current contents of the Service Request Enable Register. When the Service Request Enable Register is read, the value returned is the bit weights of all bits that are set at the time the byte is read. Refer to Table 4-9 for information on the bits in the Service Request Enable Register.

Table 4-9
Service Request Enable Register

Bit:	Weight:	Enables:
7	128	Not defined. Read as zero.
6	64	Not defined. Read as zero.
5	32	ESB - Event Status Bit
4	16	MAV - Message Available
3	8	Not defined. Read as zero.
2	4	TSS - Test Status Summary
1	2	PAV - Print Available
0	1	EAV - Error Message Available

Example:

- >*SRE 16
- Enable bit 4 MAV to set the Master Status Summary bit.
- >*SRE?
- 16
- Requests the SRE register status.
- INTERCEPTOR responds with current value of SRE register.

*STB

Status Byte

query only

The ***STB?** query requests the current value of the INTERCEPTOR status byte. When you read the Status Byte Register, the value returned is the bit weight of all bits that are set at the time you read the byte. The Status Byte Register contains the same value that is read by a serial poll over the IEEE-488 bus. Refer to Table 4-10 for information on each bit in the Status Byte Register. For additional information see command ***SRE** and Subsection 4.5, Status Reporting.

Table 4-10
Status Byte Register

Bit:	Weight:	Enables:
7	128	Not defined. Read as zero.
6	64	MSS - Master Status Summary
5	32	ESB - Event Status Bit
4	16	MAV - Message Available
3	8	Not defined. Read as zero.
2	4	TSS - Test Status Summary
1	2	PAV - Print Available
0	1	EAV - Error Message Available

Example:

- >*STB?
- 33
- Requests the INTERCEPTOR Status Byte Register status.
- The response 33 indicates that the ESB and EAV bits are set.



*TRG

Trigger

command only

The ***TRG** command executes a device trigger, causing the INTERCEPTOR to clear all results. This command is similar to the RESULT:CLEAR command. The ***TRG** command performs the same function as a device trigger over the IEEE-488 bus.

Example:

>***TRG** INTERCEPTOR clears all results.

*TST

Self-Test

query only

The ***TST?** query indicates whether the INTERCEPTOR passed or failed its last self-test. The INTERCEPTOR performs a self-test when powered ON. The ***TST** query does not perform the test. If the ***TST** query returns a value of 0, this indicates that no problems were encountered during the self-test. A value of 1 indicates that a problem occurred during the self-test. Possible problems identified by the self-test are ROM failure, RAM failure, and NOVRAM loss.

Example:

>***TST?** Requests the self-test status.
0 Self-test was successful.

*WAI

Wait

command only

The ***WAI** command causes all previous commands to complete before executing any other commands or queries.

NOTE: The INTERCEPTOR executes all commands serially; therefore, the ***WAI** command is not necessary.

Example:

>**MODE 2M; *WAI;** Causes all commands previous to the ***WAI** command to execute
MODE:2M:FRAMING ON before starting the commands after ***WAI**.

4.4.2 ERROR INSERT COMMANDS

The Error Insert commands are used to control the insertion of frame, logic, and code errors into the data stream.

The Error Insert commands and queries accepted by the INTERCEPTOR are:

command:	query:
ERR_INS:CODE	ERR_INS:CODE?
ERR_INS:CODE:RATE	ERR_INS:CODE:RATE?
ERR_INS:CODE:SINGLE	
ERR_INS:FRAME	ERR_INS:FRAME?
ERR_INS:FRAME:ADJ	ERR_INS:FRAME:ADJ?
ERR_INS:FRAME:RATE	ERR_INS:FRAME:RATE?
ERR_INS:FRAME:SINGLE	
ERR_INS:LOGIC	ERR_INS:LOGIC?
ERR_INS:LOGIC:RATE	ERR_INS:LOGIC:RATE?
ERR_INS:LOGIC:SINGLE	

CODE	
Code Error Insertion	command/query
ERR_INS:CODE [ON OFF]	Controls constant rate code error insertion. ON inserts code errors into the data stream at a fixed rate (determined by the value set by the code rate command). OFF disables insertion of code errors.
ERR_INS:CODE?	Requests the current code error insertion status.
ERR_INS:CODE:RATE <rate value>	Set the code error insertion rate. Rate value selections are: 1.0E-3, 1.0E-4, 1.0E-5, and 1.0E-6.
ERR_INS:CODE:RATE?	Requests the current code error insertion rate.
ERR_INS:CODE:SINGLE	Inserts a single code error into the data stream.

NOTE: Input the <rate value> exactly as: 1.0E-3,1.0E-4, 1.0E-5, or 1.0E-6. No other syntax is acceptable.



Example:

- >ERR_INS:CODE?
OFF Requests code error insertion status.
Code error insertion is OFF.
- >ERR_INS:CODE:RATE 1.0E-5 Sets the code insertion rate to 1.0E-5.
- >ERR_INS:CODE ON Turns the code error insertion ON.
- >ERR_INS:CODE:SINGLE Inserts a single code error into the data stream.

FRAME

Frame Error Insertion	command/query
ERR_INS:FRAME [ON OFF]	Controls rate frame error insertion. ON causes frame errors to be inserted. The adjacent number and rate determine the number of frame errors inserted into the data stream. OFF disables frame error insertion.
ERR_INS:FRAME?	Requests the current frame error insertion status.
ERR_INS:FRAME:ADJ <number>	Sets the number of adjacent errors inserted. The adjacent frame error selections are: 1, 2, 3, or 4.
ERR_INS:FRAME:ADJ?	Requests the number of adjacent frame errors inserted.
ERR_INS:FRAME:RATE <rate value>	Sets the error insertion rate. Frame error insertion rate selections are: 1.0E-3, 1.0E-4, 1.0E-5, or 1.0E-6.
ERR_INS:FRAME:RATE?	Requests the current error insertion rate.
ERR_INS:FRAME:SINGLE	Inserts a single frame error into the data stream.

NOTE: Input the <rate value> exactly as: 1.0E-3,1.0E-4, 1.0E-5, or 1.0E-6. No other syntax is acceptable.

NOTE: In Self Loop, the frame error rate detected by the INTERCEPTOR is determined by both the frame error insertion rate and the adjacent frame error setting. When the frame error insertion rate is 1.0E-5 and the adjacent frame error insertion is set to 2, the measured frame error rate equals 2.0E-5.

Example:

- >ERR_INS:FRAME:RATE 1.0E-5 Sets the frame insertion rate to 1.0E-5.

- >ERR_INS:FRAME:ADJ 2 Inserts two adjacent frame errors.
- >ERR_INS:FRAME ON Turns the frame error insertion ON.
- >ERR_INS:FRAME:SINGLE Inserts a single frame error into the data stream.

LOGIC

Logic Error Insertion	command/query
ERR_INS:LOGIC [ON OFF]	Controls the logic error insertion. ON enables logic errors to be inserted into the data stream at the rate determined by the rate value selection. OFF disables logic error insertions.
ERR_INS:LOGIC?	Requests the current logic error insertion status.
ERR_INS:LOGIC:RATE <rate value>	Sets the logic error insertion rate. Valid logic rate value selections are: 1.0E-3, 1.0E-4, 1.0E-5, and 1.0E-6.
ERR_INS:LOGIC:RATE?	Requests the current logic error insertion rate.
ERR_INS:LOGIC:SINGLE	Inserts a single logic error into the data stream.

NOTE: Input the <rate value> exactly as 1.0E-3,1.0E-4, 1.0E-5, or 1.0E-6. No other syntax is acceptable.

Example:

- >ERR_INS:LOGIC:RATE 1.0E-5 Sets the logic insertion rate to 1.0E-5.
- >ERR_INS:LOGIC:RATE?
1.0E-5 Requests the logic insertion rate.
 Current logic insertion rate is 1.0E-5.
- >ERR_INS:LOGIC ON Turns the logic error insertion ON.
- >ERR_INS:LOGIC:SINGLE Inserts a single logic error into the data stream.

4.4.3 MODE COMMANDS

The MODE commands are used to set up the operating mode and configure the INTERCEPTOR mode-dependent features before running a test.



The MODE commands and queries are:

command:

MODE
MODE:SUMMARY
MODE:2M:AIS
MODE:2M:FAS_DIS
MODE:2M:MFAS_DIS
MODE:2M:FRAMING
MODE:2M:CODING
MODE:2M:FORMAT
MODE:2M:TS16
MODE:2M:CRC4
MODE:2M:INTL_BIT
MODE:2M:NFAS
MODE:8M:AIS
MODE:8M:FRAMING
MODE:8M:CODING
MODE:8M:REMOTE
MODE:34M:AIS
MODE:34M:FRAMING
MODE:34M:CODING
MODE:34M:REMOTE
MODE:140M:AIS
MODE:140M:FRAMING
MODE:140M:CODING
MODE:140M:REMOTE
MODE:140M:RX_CLK_POL
MODE:MUX:INPUT
MODE:MUX:ANALYSIS
MODE:MUX:OUTPUT
MODE:MUX:2M:AIS
MODE:MUX:2M:FAS_DIS
MODE:MUX:2M:MFAS_DIS
MODE:MUX:2M:FRAMING
MODE:MUX:2M:FORMAT
MODE:MUX:2M:TS16
MODE:MUX:2M:CRC4
MODE:MUX:2M:INTL_BIT
MODE:MUX:2M:NFAS
MODE:MUX:8M:AIS
MODE:MUX:8M:FRAMING

query:

MODE?
MODE:SUMMARY?
MODE:2M:AIS?
MODE:2M:FAS_DIS?
MODE:2M:MFAS_DIS?
MODE:2M:FRAMING?
MODE:2M:CODING?
MODE:2M:FORMAT?
MODE:2M:TS16?
MODE:2M:CRC4?
MODE:2M:INTL_BIT?
MODE:2M:NFAS?
MODE:8M:AIS?
MODE:8M:FRAMING?
MODE:8M:CODING?
MODE:8M:REMOTE?
MODE:34M:AIS?
MODE:34M:FRAMING?
MODE:34M:CODING?
MODE:34M:REMOTE?
MODE:140M:AIS?
MODE:140M:FRAMING?
MODE:140M:CODING?
MODE:140M:REMOTE?
MODE:140M:RX_CLK_POL?
MODE:MUX:INPUT?
MODE:MUX:ANALYSIS?
MODE:MUX:OUTPUT?
MODE:MUX:2M:AIS?
MODE:MUX:2M:FAS_DIS?
MODE:MUX:2M:MFAS_DIS?
MODE:MUX:2M:FRAMING?
MODE:MUX:2M:FORMAT?
MODE:MUX:2M:TS16?
MODE:MUX:2M:CRC4?
MODE:MUX:2M:INTL_BIT?
MODE:MUX:2M:NFAS?
MODE:MUX:8M:AIS?
MODE:MUX:8M:FRAMING?

command:

MODE:MUX:8M:REMOTE
 MODE:MUX:34M:AIS
 MODE:MUX:34M:FRAMING
 MODE:MUX:34M:REMOTE
 MODE:MUX:140M:AIS
 MODE:MUX:140M:FRAMING
 MODE:MUX:140M:REMOTE
 MODE:MUX:140M:RX_CLK_POL
 MODE:MUX:Nx64
 MODE:MUX:Nx64:Mx64:TXTS
 MODE:MUX:Nx64:Mx64:RXTS
 MODE:MUX:Nx64:Mx56:TXTS
 MODE:MUX:Nx64:Mx56:RXTS
 MODE:MUX:Nx64:HANDSET:TXTS
 MODE:MUX:Nx64:HANDSET:RXTS
 MODE:MUX:Nx64:600OHM:TXTS
 MODE:MUX:Nx64:600OHM:RXTS
 MODE:MUX:Nx64:Nx64:FIRST_TXTS
 MODE:MUX:Nx64:Nx64:FIRST_RXTS
 MODE:MUX:Nx64:Nx56:FIRST_TXTS
 MODE:MUX:Nx64:Nx56:FIRST_RXTS
 MODE:MUX:Nx64:Nx64:NUM_TXTS
 MODE:MUX:Nx64:Nx64:NUM_RXTS
 MODE:MUX:Nx64:Nx56:NUM_TXTS
 MODE:MUX:Nx64:Nx56:NUM_RXTS
 MODE:MUX:Nx64:HANDSET:FILLABCD
 MODE:MUX:Nx64:HANDSET:TXABCD
 MODE:MUX:Nx64:600OHM:FILLABCD
 MODE:MUX:Nx64:600OHM:TXABCD
 MODE:MUX:Nx64:Nx64:IDLE
 MODE:MUX:Nx64:Nx56:IDLE
 MODE:MUX:Nx64:Mx64:IDLE
 MODE:MUX:Nx64:Mx56:IDLE
 MODE:MUX:Nx64:HANDSET:IDLE
 MODE:MUX:Nx64:600OHM:IDLE
 MODE:MUX:Nx64:Nx64:FILL
 MODE:MUX:Nx64:Nx56:FILL
 MODE:MUX:Nx64:Mx64:FILL
 MODE:MUX:Nx64:Mx56:FILL
 MODE:MUX:Nx64:HANDSET:FILL
 MODE:MUX:Nx64:600OHM:FILL

query:

MODE:MUX:8M:REMOTE?
 MODE:MUX:34M:AIS?
 MODE:MUX:34M:FRAMING?
 MODE:MUX:34M:REMOTE?
 MODE:MUX:140M:AIS?
 MODE:MUX:140M:FRAMING?
 MODE:MUX:140M:REMOTE?
 MODE:MUX:140M:RX_CLK_POL?
 MODE:MUX:Nx64?
 MODE:MUX:Nx64:Mx64:TXTS?
 MODE:MUX:Nx64:Mx64:RXTS?
 MODE:MUX:Nx64:Mx56:TXTS?
 MODE:MUX:Nx64:Mx56:RXTS?
 MODE:MUX:Nx64:HANDSET:TXTS?
 MODE:MUX:Nx64:HANDSET:RXTS?
 MODE:MUX:Nx64:600OHM:TXTS?
 MODE:MUX:Nx64:600OHM:RXTS?
 MODE:MUX:Nx64:Nx64:FIRST_TXTS?
 MODE:MUX:Nx64:Nx64:FIRST_RXTS?
 MODE:MUX:Nx64:Nx56:FIRST_TXTS?
 MODE:MUX:Nx64:Nx56:FIRST_RXTS?
 MODE:MUX:Nx64:Nx64:NUM_TXTS?
 MODE:MUX:Nx64:Nx64:NUM_RXTS?
 MODE:MUX:Nx64:Nx56:NUM_TXTS?
 MODE:MUX:Nx64:Nx56:NUM_RXTS?
 MODE:MUX:Nx64:HANDSET:FILLABCD?
 MODE:MUX:Nx64:HANDSET:TXABCD?
 MODE:MUX:Nx64:600OHM:FILLABCD?
 MODE:MUX:Nx64:600OHM:TXABCD?
 MODE:MUX:Nx64:Nx64:IDLE?
 MODE:MUX:Nx64:Nx56:IDLE?
 MODE:MUX:Nx64:Mx64:IDLE?
 MODE:MUX:Nx64:Mx56:IDLE?
 MODE:MUX:Nx64:HANDSET:IDLE?
 MODE:MUX:Nx64:600OHM:IDLE?
 MODE:MUX:Nx64:Nx64:FILL?
 MODE:MUX:Nx64:Nx56:FILL?
 MODE:MUX:Nx64:Mx64:FILL?
 MODE:MUX:Nx64:Mx56:FILL?
 MODE:MUX:Nx64:HANDSET:FILL?
 MODE:MUX:Nx64:600OHM:FILL?

command:

MODE:MUX:Nx64:TIE
MODE:MUX:CODING
MODE:MUX:CODING_140
MODE:MUX:DEMUX_8:TRIB
MODE:MUX:DEMUX_34:TRIB
MODE:MUX:DEMUX_140:TRIB
MODE:MUX:MUX_8:TRIB
MODE:MUX:MUX_8:FILL
MODE:MUX:MUX_34:TRIB
MODE:MUX:MUX_34:FILL
MODE:MUX:MUX_140:TRIB
MODE:MUX:MUX_140:FILL

query:

MODE:MUX:Nx64:TIE?
MODE:MUX:CODING?
MODE:MUX:CODING_140?
MODE:MUX:DEMUX_8:TRIB?
MODE:MUX:DEMUX_34:TRIB?
MODE:MUX:DEMUX_140:TRIB?
MODE:MUX:MUX_8:TRIB?
MODE:MUX:MUX_8:FILL?
MODE:MUX:MUX_34:TRIB?
MODE:MUX:MUX_34:FILL?
MODE:MUX:MUX_140:TRIB?
MODE:MUX:MUX_140:FILL?

MODE

Test Mode	command/query
MODE [2M 8M 34M 140M MUX]	Selects the INTERCEPTOR test set operating mode: 2M, 8M, 34M, or 140M selects the dedicated operating mode. MUX selects the mux/demux operating mode.
MODE?	Requests the currently selected test mode.
Example:	
>MODE? 2M	Requests the selected test mode.
>MODE 8M	Set the test mode to 8M dedicated testing.

2M	
2M Dedicated Testing	command/query
MODE:2M:FRAMING [ON OFF]	Controls the 2M dedicated testing selection. ON selects the 2M framed operating mode. OFF selects the unframed operating mode.
MODE:2M:FRAMING?	Request the framing status for 2M dedicated testing.
MODE:2M:CODING [HDB3 AMI NRZ RZ]	Set the coding type for 2M dedicated testing. Coding selections are: HDB3, AMI, NRZ, or RZ.

MODE:2M:CODING?	Request the coding configuration when testing as a 2M dedicated test instrument.
MODE:2M:FORMAT [120 75]	Select the 2M line compensation. Line compensation choices are for twisted pair (120Ω) or coaxial cable (75Ω).
MODE:2M:FORMAT?	Request the format configuration when testing as a 2M dedicated test instrument.
MODE:2M:TS16 [ON OFF]	Controls timeslot 16 for 2M dedicated testing. This choice is only valid when framing is set ON.
MODE:2M:TS16?	Request the status of timeslot 16 when testing as a 2M dedicated test instrument.
MODE:2M:CRC4 [ON OFF]	Set CRC4 for 2M dedicated testing. This choice is only valid when framing is set ON.
MODE:2M:CRC4?	Request the status of CRC4 when testing as a 2M dedicated test instrument.
MODE:2M:AIS [ON OFF]	Select the 2M forced AIS status. 2M AIS choices are: ON or OFF.
MODE:2M:AIS?	Request the 2M forced AIS status when testing as a 2M dedicated test instrument.
MODE:2M:FAS_DIS [ON OFF]	Set the 2M forced remote alarm in straight mode. 2M remote alarm choices are: ON or OFF.
MODE:2M:FAS_DIS?	Request the status of the 2M forced remote alarm in straight mode.
MODE:2M:MFAS_DIS [ON OFF]	Set the 2M forced MFAS remote alarm in straight mode. 2M MFAS choices are: ON or OFF.
MODE:2M:MFAS_DIS?	Request the status of the 2M forced MFAS remote alarm in straight mode.
MODE:2M:INTL_BIT [1 0]	Set the international bit in 2M dedicated testing. The international bit choices are: 1 or 0.
MODE:2M:INTL_BIT?	Request the status of the 2M international bit.
MODE:2M:NFAS “bit string”	Set the NFAS word in 2M dedicated testing. The NFAS word is 8-bits. NFAS bit choices are: 1 or 0 for each of the 8 bits.
MODE:2M:NFAS?	Request the status of the 2M NFAS word.

Example:

>MODE:2M:FRAMING? Requests current framing status for 2M dedicated testing.
OFF

>MODE:2M:FRAMING ON	Enables framing for 2M dedicated testing.
>MODE:2M:FORMAT 120	Enables line compensation for twisted pair.
>MODE:2M:CRC4? OFF	Requests the status of CRC4.
>MODE:2M:CRC4 ON	Enables CRC4.
>MODE:2M:TS16? OFF	Requests the status of timeslot 16.
>MODE:2M:TS16 ON	Enables timeslot 16.

8M

8M Dedicated Testing

command/query

MODE:8M:FRAMING [ON OFF]	Controls the 8M dedicated testing framing selection. ON selects the 8M framed operating mode. OFF selects the unframed operating mode.
MODE:8M:FRAMING?	Request the framing status for 8M dedicated testing.
MODE:8M:CODING [HDB3 AMI NRZ RZ]	Set the coding type for 8M dedicated testing. Coding choices are: HDB3, AMI, NRZ, or RZ.
MODE:8M:CODING?	Request the coding configuration when testing as an 8M dedicated test instrument.
MODE:8M:AIS [ON OFF]	Set the 8M forced AIS alarm. 8M AIS choices are: ON or OFF.
MODE:8M:AIS?	Request the 8M AIS alarm status.
MODE:8M:REMOTE [ON OFF]	Set the 8M forced remote alarm. 8M remote alarm choices are: ON or OFF.
MODE:8M:REMOTE?	Request the 8M forced remote alarm status.

Example:

>MODE:8M:FRAMING? OFF	Requests current framing status is OFF.
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- >MODE:8M:FRAMING ON Enables framing.
- >MODE:8M:CODING? Requests current coding status.
AMI
- >MODE:8M:CODING HDB3 Sets coding to HDB3.

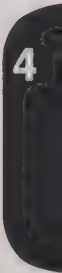
34M

34M Dedicated Testing command/query

- MODE:34M:FRAMING [ON|OFF] Controls the 34M dedicated testing framing selection. ON selects the 34M framed operating mode. OFF selects the unframed operating mode.
- MODE:34M:FRAMING? Requests the framing status for 34M dedicated testing.
- MODE:34M:CODING [HDB3|AMI|NRZ|RZ] Set the coding type for 34M dedicated testing. Coding choices are: HDB3, AMI, NRZ, or RZ.
- MODE:34M:CODING? Requests the coding configuration when testing as a 34M dedicated test instrument.
- MODE:34M:AIS [ON|OFF] Set the 34M forced AIS alarm. 34M AIS choices are: ON or OFF.
- MODE:34M:AIS? Request the 34M AIS alarm status.
- MODE:34M:REMOTE [ON|OFF] Set the 34M forced remote alarm. 34M remote alarm choices are: ON or OFF.
- MODE:34M:REMOTE? Request the 34M forced remote alarm status.

Example:

- >MODE:34M:FRAMING? Requests current framing status is OFF.
OFF
- >MODE:34M:FRAMING ON Enables framing.
- >MODE:34M:CODING? Requests current coding status is AMI.
AMI
- >MODE:34M:CODING HDB3 Sets coding to HDB3.



140M

140M Dedicated Testing command/query

MODE:140M:FRAMING [ON OFF]	Controls the 140M dedicated testing framing selection. ON selects the 140M framed operating mode. OFF selects the unframed operating mode.
MODE:140M:FRAMING?	Requests the framing status for 140M dedicated testing.
MODE:140M:CODING [CMI NRZ]	Set the coding type for 140M dedicated testing. Coding selections are: CMI or NRZ.
MODE:140M:CODING?	Requests the coding configuration when testing as a 140M dedicated test instrument.
MODE:140M:AIS [ON OFF]	Set the 140M forced AIS alarm. 140M AIS choices are: ON or OFF.
MODE:140M:AIS?	Request the 140M AIS alarm status.
MODE:140M:REMOTE [ON OFF]	Set the 140M forced remote alarm. 140M remote alarm choices are: ON or OFF.
MODE:140M:REMOTE?	Request the 140M forced remote alarm status.

Example:

MODE:140M:RX_CLK_POL (INVERT/NORMAL)	Set the polarity of the 140M external Rx Clock input.
>MODE:140M:FRAMING? OFF	Requests current framing status is OFF.
>MODE:140M:FRAMING ON	Enables framing.
>MODE:140M:CODING? CMI	Requests current coding status is CMI.
>MODE:140M:CODING NRZ	Sets coding to NRZ.

MUX

Multiplexer Testing

command/query

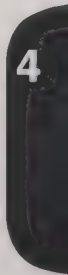
MODE:MUX:INPUT [140M 34M 8M 2M]	Select the MUX mode input data rate. Input rate selections are: 140M, 34M, 8M, or 2M.
MODE:MUX:INPUT?	Requests the MUX mode input data rate.
MODE:MUX:ANALYSIS [140M 34M 8M 2M Nx64]	Selects the MUX mode analysis data rate. Analysis rate selections are: 140M, 34M, 8M, 2M, or NX64.
MODE:MUX:ANALYSIS?	Requests the MUX mode analysis rate.
MODE:MUX:OUTPUT [140M 34M 8M 2MRx 2M=Rx]	Selects the MUX mode output data rate. Output rate selections are: 2M, 2MRX, 8M, 34M, or 140M.
MODE:MUX:OUTPUT?	Requests the MUX mode output rate.

Certain combinations of input, analysis, and output rates are not valid (e.g., 2M INPUT, 8M ANALYSIS, 2M OUTPUT). The analysis rate must be less than or equal to the lower rate between the input and the output signal. If the INTERCEPTOR is configured for an invalid rate combination, the error message **Invalid Mux Setup** appears in the error buffer, and the mux rates maintain their last valid values.

In order to reduce the possibility of an invalid rate configuration, the INTERCEPTOR postpones processing rate-setting commands until all other commands of the program message have been read. The postponed rate-setting commands are considered at the same time. An error is flagged only if the final mux configuration is invalid.

Example:

>MODE:MUX:INPUT?; ANALYSIS?; OUTPUT? 2M; 2M; 2M	Requests the current configuration of the input, analysis, and output rate. Input 2M; Analysis 2M; Output 2M.
>MODE:MUX:ANALYSIS 8M; INPUT 8M	Set the analysis rate to 8M and input rate to 8M.
>MODE:MUX:INPUT?; ANALYSIS?; OUTPUT? 8M; 8M; 2M	Request the current configuration of the input, analysis, and output rate. Input 8M; Analysis 8M; Output 2M.



NOTE: The preceding setup sequence configures the INTERCEPTOR with input 2M, analysis 8M, and output 2M. That configuration is invalid. An error was not generated because the final mux setup, input 8M, analysis 8M, output 2M, is valid. Only the final configuration at the end of each program message is actually configured.

2M	
2M Multiplexer Testing	command/query
MODE:MUX:2M:FRAMING [ON OFF]	Controls framing for 2M multiplexer testing. ON selects the 2M framing operating mode. OFF selects the unframed operating mode.
MODE:MUX:2M:FRAMING?	Request the framing status for 2M multiplexer testing.
MODE:MUX:2M:FORMAT [120 75]	Select the line compensation. Select 120 for twisted pair or 75 for coaxial cable.
MODE:MUX:2M:FORMAT?	Request the format configuration when testing as a 2M multiplexer test instrument.
MODE:MUX:2M:TS16 [ON OFF]	Set timeslot 16 for 2M multiplexer testing. Only valid if framing is set ON.
MODE:MUX:2M:TS16?	Request the status of timeslot 16 when testing as a 2M multiplexer test instrument. Only valid if framing is set ON.
MODE:MUX:2M:CRC4 [ON OFF]	Set CRC4 for 2M multiplexer testing. Only valid if framing is set ON.
MODE:MUX:2M:CRC4?	Request the status of CRC4 when testing as a 2M multiplexer test instrument.
MODE:MUX:2M:AIS [ON OFF]	Set the forced AIS status when testing as a 2M multiplexer test instrument. 2M AIS choices are: ON or OFF.
MODE:MUX:2M:AIS?	Request the 2M forced AIS status when testing as a 2M multiplexer test instrument.
MODE:MUX:2M:FAS_DIS [ON OFF]	Set the 2M forced remote alarm when testing as a 2M multiplexer test instrument. 2M remote alarm choices are: ON or OFF.
MODE:MUX:2M:FAS_DIS?	Request the status of the 2M forced remote alarm when testing as a 2M multiplexer test instrument.

MODE:MUX:2M:MFAS_DIS [ON OFF]	Set the 2M forced MFAS remote alarm when testing as a 2M multiplexer test instrument. 2M MFAS choices are: ON or OFF.
MODE:MUX:2M:MFAS_DIS?	Request the status of the 2M forced MFAS remote alarm when testing as a 2M multiplexer test instrument.
MODE:MUX:2M:INTL_BIT (0 1)	Sets the International bit when in mux mode.
MODE:MUX:2M:INTL_BIT?	Requests the International bit used for mux mode.
MODE:MUX:2M:NFAS "Bit String"	Sets the NFAS word used for mux mode. The NFAS Word is 8-bits. NFAS Word choices are: 1 or 0 for each of the 8 bits.
MODE:MUX:2M:NFAS?	Requests the NFAS word used for mux mode.

Example:

>MODE:MUX:2M:FRAMING? OFF	Requests current framing status for 2M rate of a mux test.
>MODE:MUX:2M:FRAMING ON	Enables framing for 2M rate of a mux test.
>MODE:MUX:2M:FORMAT 120	Enables line compensation for twisted pair.
>MODE:MUX:2M:CRC4? OFF	Requests the status of CRC4.
>MODE:MUX:2M:CRC4 ON	Enables CRC4.
>MODE:MUX:2M:TS16? OFF	Requests the status of timeslot 16.
>MODE:MUX:2M:TS16 ON	Enables timeslot 16.
>MODE:MUX:2M:NFAS "01010101"	Set the transmitted NFAS word to 01010101.

8M	
8M Multiplexer Testing	command/query
MODE:MUX:8M:FRAMING [ON OFF]	Set the framing for 8M multiplexer testing. ON selects the 8M framed operating mode. OFF selects the unframed 8M operating mode.
MODE:MUX:8M:FRAMING?	Request the framing status for 8M multiplexer testing.
MODE:MUX:8M:AIS [ON OFF]	Set the forced AIS status when testing as an 8M multiplexer test instrument. 8M AIS choices are: ON or OFF.
MODE:MUX:8M:AIS?	Request the 8M forced AIS status when testing as a 8M multiplexer test instrument.
MODE:MUX:8M:REMOTE [ON OFF]	Set the 8M forced remote alarm when testing as a 8M multiplexer test instrument. 8M remote alarm choices are: ON or OFF.
MODE:MUX:8M:REMOTE?	Request the status of the 8M forced remote alarm when testing as a 8M multiplexer test instrument.

Example:

>MODE:MUX:8M:FRAMING? OFF	Requests current framing status is OFF.
>MODE:MUX:8M:FRAMING ON	Enables framing.

34M	
34M Multiplexer Testing	command/query
MODE:MUX:34M:FRAMING [ON OFF]	Set the framing for 34M multiplexer testing. ON selects the 34M framed operating mode. OFF selects the unframed 34M operating mode.
MODE:MUX:34M:FRAMING?	Requests the framing status for 34M multiplexer testing.
MODE:MUX:34M:AIS [ON OFF]	Set the forced AIS status when testing as a 34M multiplexer test instrument. 34M AIS choices are: ON or OFF.
MODE:MUX:34M:AIS?	Request the 34M forced AIS status when testing as a 34M multiplexer test instrument.

MODE:MUX:34M:REMOTE [ON OFF]	Set the 34M forced remote alarm when testing as a 34M multiplexer test instrument. 34M remote alarm choices are: ON or OFF.
MODE:MUX:34M:REMOTE?	Request the status of the 34M forced remote alarm when testing as a 34M multiplexer test instrument.

Example:

>MODE:MUX:34M:FRAMING? Requests current framing status is OFF.
OFF

>MODE:MUX:34M:FRAMING Enables framing.
ON

140M

140M Multiplexer Testing	command/query
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MODE:MUX:140M:FRAMING [ON OFF]	Sets the framing for 140M multiplexer testing. ON selects the 140M framed operating mode. OFF selects the unframed 140M operating mode.
MODE:MUX:140M:FRAMING?	Requests the framing status for 140M multiplexer testing.
MODE:MUX:140M:AIS [ON OFF]	Set the forced AIS status when testing as a 140M multiplexer test instrument. 140M AIS choices are: ON or OFF.
MODE:MUX:140M:AIS?	Request the 140M forced AIS status when testing as a 140M multiplexer test instrument.
MODE:MUX:140M:REMOTE [ON OFF]	Set the 140M forced remote alarm when testing as a 140M multiplexer test instrument. 140M remote alarm choices are: ON or OFF.
MODE:MUX:140M:REMOTE?	Request the status of the 140M forced remote alarm when testing as a 140M multiplexer test instrument.

Example:

>MODE:MUX:140M:FRAMING? Requests current framing status is OFF.
OFF

>MODE:MUX:140M:FRAMING Enables framing.
ON

MUX:Nx64

Nx64 Multiplexer Testing

command/query

MODE:MUX:Nx64 [Nx64 Mx64 Nx56 Mx56 handset 600ohm]	Sets the Nx64 mode. The parameters are Nx64, Mx64, Nx56, Mx56, HAND SET, or 600Ω.
MODE:MUX:Nx64?	Requests the Nx64 mode.
MODE:MUX:Nx64:	Sets the state of a specific transmit timeslot in non-contiguous mode.
Mx64:TXTS (1-31), (ON/OFF)	The parameter is a timeslot number (1 to 31) and a state, which is ON or OFF.
MODE:MUX:Nx64:	Requests the state of a specific transmit timeslot in noncontiguous mode.
Mx64:TXTS? (1-31)	The parameter is a timeslot number between 1 and 31.
MODE:MUX:Nx64: Mx64:RXTS (1-31) (ON/OFF)	Sets the state of a specific receive timeslot in non-contiguous mode. The parameter is a timeslot number (1 to 31) and a state, which is ON or OFF.
Mx56:TXTS (1-31), [ON OFF]	The parameter is a timeslot number (1 to 31) and a state, which is ON or OFF.
MODE:MUX:Nx64:	Requests the state of a transmit timeslot in non-contiguous mode.
Mx56:TXTS? (1-31) MODE:MUX:Nx64:	The parameter is a timeslot number between 1 and 31. Sets the state of a specific receive timeslot in non-contiguous mode.
Mx56:RXTS (1-31) [ON OFF]	The parameter is a timeslot number (1 to 31) and a state, which is ON or OFF.
MODE:MUX:Nx64: Mx56:RXTS? (1-31)	Requests the state of a specific receive timeslot in non-contiguous mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: HANDSET:TXTS (1-31)	Sets the transmit timeslot for handset mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: HANDSET:TXTS?	Requests the specific transmit timeslot for handset mode. The parameter is a timeslot number (1 to 31).

MODE:MUX:Nx64: HANDSET:RXTS	Sets the state of a specific receive timeslot for handset mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: HANDSET:RXTS? (1-31) [ON OFF]	Requests the receive timeslot for handset mode.
MODE:MUX:Nx64: 600OHM:TXTS (1-31)	Sets the transmit timeslot for 600Ω mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: 600OHM:TXTS?	Requests transmit timeslot for 600Ω mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: 600OHM:RXTS	Sets the receive timeslot for 600Ω mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: 600OHM:RXTS?	Requests the receive timeslot for 600Ω mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: Nx64:FIRST_TXTS (1-31)	Sets the first transmit timeslot for contiguous mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: Nx64:FIRST_TXTS?	Requests the first transmit timeslot for contiguous mode.
MODE:MUX:Nx64: Nx64:FIRST_RXTS (1-31)	Sets the first receive timeslot for contiguous mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: Nx64:FIRST_RXTS?	Requests the first receive timeslot for contiguous mode.
MODE:MUX:Nx64: Nx56:FIRST_TXTS (1-31)	Sets the first transmit timeslot for contiguous mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: Nx56:FIRST_TXTS?	Requests the first transmit timeslot for contiguous mode.
MODE:MUX:Nx64: Nx56:FIRST_RXTS (1-31)	Sets the first receive timeslot for contiguous mode. The parameter is a timeslot number (1 to 31).
MODE:MUX:Nx64: Nx56:FIRST_RXTS?	Requests the first receive timeslot for contiguous mode.

**MODE:MUX:Nx64:
Nx64:NUM_TXTS (1-31)**

Sets the number of contiguous transmit timeslots for contiguous mode. The parameter is a timeslot number (1 to 31).

**MODE:MUX:Nx64:
Nx56:NUM_RXTS?**

Requests the number of contiguous transmit timeslots for contiguous mode.

**MODE:MUX:Nx64:
HANDSET:FILLABCD**

Sets the ABCD signaling bits used for each of the filled timeslots. The parameter is four characters representing the ABCD “**bit-pattern**” bits enclosed in quotes.

**MODE:MUX:Nx64:
HANDSET:FILLABCD?**

Requests the ABCD signaling bits used for each of the filled timeslots.

**MODE:MUX:Nx64:
HANDSET:TXABCD
“bit-string”**

Sets the ABCD signaling bits used for the transmit timeslot. The parameter is four characters representing the ABCD bits enclosed in quotes.

**MODE:MUX:Nx64:
HANDSET:TXABCD?**

Requests the ABCD signaling bits used for the transmit timeslot.

**MODE:MUX:Nx64:
600OHMS:FILLABCD
“bit-string”**

Sets the ABCD signaling bits used for each of the filled timeslots. The parameter is four characters representing the ABCD bits enclosed in quotes.

**MODE:MUX:Nx64:
600OHMS:FILLABCD?**

Requests the ABCD signaling bits used for each of the filled timeslots.

**MODE:MUX:Nx64:
600OHMS:TXABCD
“bit-string”**

Sets the ABCD signaling bits used for the transmit timeslot.

**MODE:MUX:Nx64:
600OHMS:TXABCD?**

Requests the ABCD signaling bits used for each of the transmit timeslots. The parameter is four characters representing the ABCD bits enclosed in quotes.

**MODE:MUX:Nx64:
Nx64:IDLE
“bit-string”**

Sets the idle code that may be used to fill unused Tx timeslots with Nx64 mode. The idle code is 8-bits. IDLE bit choices are 1 or 0 for each of the 8 bits.

**MODE:MUX:Nx64:
Nx64:IDLE?**

Requests the idle code used for Nx64 mode.

MODE:MUX:Nx64: Nx56:IDLE “bit-string”	Sets the idle code that may be used to fill unused Tx timeslots with Nx56 mode. The idle code is 8-bits. IDLE bit choices are 1 or 0 for each of the 8 bits.
MODE:MUX:Nx64: Nx56:IDLE?	Requests the idle code used for Nx56 mode.
MODE:MUX:Nx64:	Sets the idle code that may be used to fill timeslots with Mx64 “bit-string” mode. The idle code is 8-bits. IDLE bit choices are 1 or 0 for each of the 8 bits.
MODE:MUX:Nx64: Mx64:IDLE?	Requests the idle code used for Mx64 mode.
MODE:MUX:Nx64: Mx56:IDLE “bit-string”	Sets the idle code used for Mx56 mode. The idle code is 8-bits. Idle bit choices are 1 or 0 for each of the 8 bits.
MODE:MUX:Nx64: Mx56:IDLE?	Requests the idle code used for Mx56 mode.
MODE:MUX:Nx64: HANDSET:IDLE	Sets the idle code used for handset mode. The idle code is 8-bits. IDLE bit choices are 1 or 0 for each of the 8 bits.
MODE:MUX:Nx64: HANDSET:IDLE?	Requests the idle code used for handset mode.
MODE:MUX:Nx64: 600OHMS:IDLE “bit-string”	Sets the idle code used for 600Ω mode. IDLE bit choices are 1 or 0 for each of the 8 bits.
MODE:MUX:Nx64: 600OHMS:IDLE?	Requests the idle code used for 600Ω mode.
MODE:MUX:Nx64: Nx64:FILL [IDLE ONES]	Sets the fill pattern used to fill unused timeslots in the Nx64 mode. IDLE selects the IDLE code to fill unused timeslots. ONES uses all ones to fill unused timeslots.
MODE:MUX:Nx64: Nx64:FILL?	Requests the fill pattern used for the Nx64 mode.

MODE:MUX:Nx64: Nx56:FILL [IDLE ONES]	Sets the fill pattern used to fill unused timeslots in the Nx56 mode. IDLE selects the IDLE code to fill unused timeslots. ONES uses all ones to fill unused timeslots.
MODE:MUX:Nx64: Nx56:FILL?	Requests the fill pattern used for the Nx56 mode.
MODE:MUX:Nx64: Mx64:FILL [IDLE ONES]	Sets the fill pattern used to fill unused timeslots in Mx64 mode. IDLE selects the IDLE code to fill unused timeslots. ONES uses all ones to fill unused timeslots.
MODE:MUX:Nx64: Mx64:FILL?	Requests the fill pattern used for the Mx56 mode.
MODE:MUX:Nx64: Mx56:FILL [IDLE ONES]	Sets the fill pattern used to fill unused timeslots in Mx56 mode. IDLE selects the IDLE code to fill unused timeslots. ONES uses all ones to fill unused timeslots.
MODE:MUX:Nx64: Mx56:FILL?	Requests the fill pattern used for the Mx56 mode.
MODE:MUX:Nx64: HANDSET:FILL [IDLE ONES]	Sets the fill pattern used to fill unused timeslots in the handset mode. IDLE selects the IDLE code to fill unused timeslots. ONES uses all ones to fill unused timeslots.
MODE:MUX:Nx64: HANDSET:FILL?	Requests the fill pattern used for the handset mode.
MODE:MUX:Nx64: 600OHMS:FILL [IDLE ONES]	Sets the fill pattern to fill unused timeslots in the 600Ω mode. IDLE selects the IDLE code to fill unused timeslots. ONES uses all ones to fill unused timeslots.
MODE:MUX:Nx64: 600OHMS:FILL?	Requests the fill pattern used for 600Ω mode.

MUX:Nx64

Nx64 Multiplexer Testing

command/query

MODE:MUX:Nx64:TIE(on off)	Sets the state of the receive/transmit coupling. The parameters are On or Off.
MODE:MUX:Nx64:TIE?	Requests the state of the receive/transmit coupling

MUX:CODING

Multiplexer Coding		command/query
MODE:MUX:CODING [HDB3 AMI NRZ RZ]	Select the coding type for 2M, 8M, 34M rates of a multiplexer test. Valid multiplexer coding choices are: HDB3, AMI, NRZ, or RZ.	
MODE:MUX:CODING?	Requests the coding configuration when testing as a multiplexer test instrument.	
MODE:MUX:CODING_140 [CMI NRZ]	Select the coding type for the 140M rate of a multiplexer test. CMI or NRZ are valid coding choices for 140M.	
MODE:MUX:CODING_140?	Requests the 140M coding used for mux mode testing.	

Example:

>MODE:MUX:CODING? AMI	Requests current coding status is AMI.
>MODE:MUX:CODING HDB3	Sets coding to HDB3.

DEMUX_8:TRIB

8M to 2M Demultiplexer Tributary		command/query
MODE:MUX:DEMUX_8:TRIB [1 2 3 4]	Select the 8M to 2M demultiplexed tributary. Tributary selection values are: 1, 2, 3, or 4. The selected 2M tributary is dropped from the 8M data stream.	
MODE:MUX:DEMUX_8:TRIB?	Request the selected 8M to 2M demultiplexed tributary.	

Example:

>MODE:MUX:DEMUX_8:TRIB? 2	Requests the currently selected tributary.
>MODE:MUX:DEMUX_8:TRIB 4	Selects tributary 4 of the 8M input signal.



DEMUX_34:TRIB	
34M to 8M Demultiplexer Tributary	command/query
MODE:MUX:DEMUX_34:TRIB [1 2 3 4]	Select the 34M to 8M demultiplexed tributary. Tributary selection values are: 1, 2, 3, or 4. The selected 8M tributary is dropped from the 34M data stream.
MODE:MUX:DEMUX_34:TRIB?	Request the selected 34M to 8M demultiplexed tributary.

Example:

- >MODE:MUX:DEMUX_34:TRIB? Requests the currently selected tributary.
2
- >MODE:MUX:DEMUX_34:TRIB 4 Selects tributary 4 of the 34M input signal.

DEMUX_140:TRIB	
140M to 34M Demultiplexer Tributary	command/query
MODE:MUX:DEMUX_140:TRIB	Select the 140M to 34M demultiplexed tributary. Tributary selection values are: 1, 2, 3, or 4. The selected 34M tributary is dropped from the 140M data stream.
MODE:MUX:DEMUX_140:TRIB?	Request the selected 140M to 34M demultiplexed tributary.

Example:

- >MODE:MUX:DEMUX_140:TRIB? Requests the currently selected tributary.
2
- >MODE:MUX:DEMUX_140:TRIB4 Selects tributary 4 of the 140M input signal.

MUX_8:TRIB	
2M to 8M Multiplexer Tributary Analysis	command/query
MODE:MUX:MUX_8:TRIB [1 2 3 4 ALL]	Select the 2M to 8M multiplexer tributary. Selects the 2M tributary that is inserted into the 8M data stream. Tributary selection values are: 1, 2, 3, 4, or ALL.
MODE:MUX:MUX_8:TRIB?	Request the selected 2M to 8M multiplexer tributary.

MODE:MUX:MUX_8:FILL [ONES RND]	Select the fill pattern for the unused 2M to 8M multiplexer tributaries. Fill selections are: ONES (all 1's) or RND (random pattern).
MODE:MUX:MUX_8:FILL?	Request the selected fill pattern for the unused 2M to 8M multiplexer tributaries.
Example:	
>MODE:MUX:MUX_8:TRIB? 2	Requests the selected insertion tributary.
>MODE:MUX:MUX_8:TRIB ALL	Inserts the 2M transmit signal into ALL tributaries of the 8M transmit signal.
>MODE:MUX:MUX_8:FILL? ONES	Requests the currently selected fill pattern.
>MODE:MUX:MUX_8:FILL RND	Sets the fill pattern to random.

MUX_34:TRIB

8M to 34M Multiplexer Tributary Analysis

command/query

MODE:MUX:MUX_34:TRIB [1 2 3 4 ALL]	Select the 8M to 34M multiplexer tributary. Selects the 8M tributary that is inserted into the 34M data stream. Tributary selection values are: 1, 2, 3, 4, or ALL.
MODE:MUX:MUX_34:TRIB?	Requests the selected 8M to 34M multiplexer tributary.
MODE:MUX:MUX_34:FILL [ONES RND]	Select the fill pattern for the unused 8M to 34M multiplexer tributaries. Fill selections are: ONES (all 1's) or RND (random pattern).
MODE:MUX:MUX_34:FILL?	Requests the selected fill pattern for the unused 8M to 34M multiplexer tributaries.
Example:	
>MODE:MUX:MUX_34:TRIB? 2	Requests the selected insertion tributary.
>MODE:MUX:MUX_34:TRIB ALL	Inserts the 8M transmit signal into ALL tributaries of the 34M transmit signal..

Remote Control

>MODE:MUX:MUX_34:FILL?
ONES

Requests the currently selected fill pattern.

>MODE:MUX:MUX_34:FILL RND

Sets the fill pattern to random.

MUX_140:TRIB

34M to 140M Multiplexer Tributary Analysis command/query

MODE:MUX:MUX_140:TRIB
[1|2|3|4|ALL]

Select the 34M to 140M multiplexer tributary. Selects the 34M tributary that is inserted into the 140M data stream. Tributary selections are: 1, 2, 3, 4, or ALL.

MODE:MUX:MUX_140:TRIB?

Request the selected 34M to 140M multiplexer tributary.

MODE:MUX:MUX_140:FILL
[ONES|RND]

Select the fill pattern for the unused 34M to 140M multiplexer tributaries. Fill selections are: ONES (all 1's) or RND (random pattern).

MODE:MUX:MUX_140:FILL?

Request the selected fill pattern for the unused 34M to 140M multiplexer tributaries.

Example:

>MODE:MUX:MUX_140:TRIB?
2

Requests the selected insertion tributary.

>MODE:MUX:MUX_140:TRIB
ALL

Inserts the 34M transmit signal into ALL tributaries of the 140M transmit signal.

>MODE:MUX:MUX_140:FILL?
ONES

Requests the currently selected fill pattern.

>MODE:MUX:MUX_140:FILL
RND

Sets the fill pattern to random.

SUMMARY

Test Mode Summary query only

MODE:SUMMARY?

Responds with a brief summary of the current test mode configuration.

NOTE:

The test mode summary response is a single string composed of several fields separated by commas. The exact fields depend on the selected test mode. Table 4-11 lists the fields associated with each test mode.

Table 4-11
Test Mode Summary Response

MODE:	Mode Summary Fields:
2M	MODE, FRAMED UNFRAMED, CODING, PATTERN, CRC ON OFF, TS16 ON OFF
8M, 34M, 140M	MODE, FRAMED UNFRAMED, CODING, PATTERN
MUX	RX:RATE, AN:RATE, TX:RATE, CODING, PATTERN

Example:

- >MODE 2M

Set the test mode to 2M dedicated testing.
- >MODE:SUMMARY?
2M, FRAMED, HDB3,
2^15-1, CRC:OFF, TS16:OFF

Requests the current configuration.
- >MODE 8M

Set the test mode to 8M dedicated testing.
- >MODE:SUMMARY?
8M, FRAMED, HDB3, 2^15-1

Requests a summary of the current configuration.

4.4.3 Pattern Commands

The PATTERN commands are used to select the data pattern the INTERCEPTOR uses in testing.

The PATTERN commands and queries are:

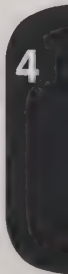
command:	query:
PATTERN	PATTERN?
PATTERN:PROGRAM	PATTERN:PROGRAM?

PATTERN

Test Pattern	command/query
--------------	---------------

PATTERN <pattern> Sets the current test pattern that is expected to be received and is transmitted by the INTERCEPTOR. Pattern selections are:

MARK	all Marks (1's)
SPACE	all Spaces (0's)



1:1	alternating 101010 pattern
1:3	one followed by three 0's
1:4	one followed by four 0's
2^6-1	2 ⁶ -1 pseudorandom pattern
2^9-1	2 ⁹ -1 pseudorandom pattern
2^11-1	2 ¹¹ -1 pseudorandom pattern
2^15-1	2 ¹⁵ -1 pseudorandom pattern
2^20-1	2 ²⁰ -1 pseudorandom pattern
2^23-1	2 ²³ -1 pseudorandom pattern
PROGRM	programmable pattern

PATTERN? Requests the current test pattern.

Example:

>PATTERN? Requests the currently selected pattern.
2^15-1

>PATTERN 1:4 Select 1:4 as the new pattern.

PROGRAM

Programmable Data Pattern command/query

PATTERN:PROGRAM
"bit-pattern" Set the current programmable test pattern. The test pattern is specified by a string of 1's and 0's enclosed in quotes. The pattern can be as short as 3 bits or as long as 24 bits.

PATTERN:PROGRAM? Request the current programmable test pattern.

Example:

>PATTERN:PROGRAM? Requests current programmable pattern.
"111111110000000000000000"

>PATTERN:PROGRAM
"1010111" Program a new programmable pattern.

>PATTERN:PROGRAM? Request the new pattern.
"1010111"

4.4.4 Print Commands

Use the PRINT commands to control the INTERCEPTOR printer. The printer can record test results and the INTERCEPTOR setup.

The PRINT commands and queries are:

command:	query:
PRINT:CONTROLS	PRINT:CONTROLS?
PRINT:ENABLE	PRINT:ENABLE?
PRINT:ERROR:<event>	PRINT:ERROR:<event>?
PRINT:HIST	PRINT:HIST?
PRINT:RESULTS	PRINT:RESULTS?
PRINT:STATUS:<event>	PRINT:STATUS:<event>?
PRINT:TERM	PRINT:TERM?
PRINT:TIMED:ENABLE	PRINT:TIMED:ENABLE?
PRINT:TIMED:INTERVAL	PRINT:TIMED:INTERVAL?
PRINT:TYPE	PRINT:TYPE?
PRINT:WIDTH	PRINT:WIDTH?

CONTROLS|RESULTS|HISTOGRAMS

Controls Results Printout		command/query
PRINT:[CONTROLS RESULTS]	Generates a manual controls or results printout. This is equivalent to pressing the CONTROLS or RESULTS print switches on the front panel. The information contained in a results print is determined by the PRINT:TYPE command.	
PRINT:[CONTROLS RESULTS]?	Generates a response to the controller. This response is formatted like a results or controls printout. This query generates a printout that is placed in the Remote Control Output Queue and sent to the controller.	
PRINT:HIST	Generates a histogram printout. See the SYSTEM:HIST commands for more information on controlling histogram printing.	
PRINT:HIST?	Generates a response to the controller. This response contains the same information that would be printed by PRINT:HIST . Also see SYSTEM:HIST for additional information on controlling histogram printing.	



Example:

>PRINT:RESULTS? Requests a formatted results print.

Manual Print		09:44:00	21	Jan	90
Bit Errs:	0	BER:	0.00E-10		
Pat Slip:	0	Pat Loss:	0		
2 Code:	0	2 CER:	0.00E-10		
2 FAS	0	2Rx Freq:	2048006		
2M PPM	+2	2Tx Freq:	2048005		
Test Sec:	10526	Elap Sec:	10526		
2M AIS:	off	FAS Dis:	off		
%Avl Sec:	100.00%	Err Sec:	0		
%EFS:	100.00%	%SES:	0.00%		
%Deg Min:	0.00%	ANALYSIS:	2M		

>PRINT:RESULTS Generates a results print on the selected printer.

ENABLE

Automatic Printout Enable command/query

PRINT:ENABLE [ON|OFF] Controls automatic printouts. Enable selections are ON (enables) or OFF (disables) automatic printouts.

PRINT:ENABLE? Requests the current automatic printout status.

The ERROR <event>, STATUS <event>, and TIMED commands determine what and when an automatic printout is generated. This command performs the same function as the **PRINTER ON|OFF** switch on the INTERCEPTOR front panel.

Example:

>PRINT:ENABLE ON Enables automatic printouts.

>PRINT:ENABLE? Requests current status of automatic printouts.
ON

ERROR:<event>

Error Event Printouts	command/query
-----------------------	---------------

PRINT:ERROR:<event>
[ON|OFF] Controls automatic printout generation when enabled error events occur. Event choices are: ON or OFF. ON enables a printout to be generated by the selected error event. OFF does not print when the event occurs. Error event selections are:

- BIT :Bit error
- CODE :code error
- FAS :frame error
- CRC :CRC error
- PAT_SLIP :pattern slip
- SES :Severely Errored Seconds error print
- PWR_LOSS :power loss
- ALL :all error events

PRINT:ERROR:<event>? Requests the current error print setting for the selected event.

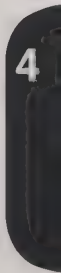
For an automatic printout to occur, PRINT ENABLE must be set to ON, the ERROR EVENT must be set to ON, and the error event must occur.

NOTE: The ALL event can not be used as a query.

Example:

>PRINT:ERROR:BIT ON Printout is triggered when a bit error occurs.

>PRINT:ERROR:CODE? Request the current print status setting for the code error.
ON



STATUS:<event>

Status Printouts	command/query
------------------	---------------

PRINT:STATUS:<event>
[ON|OFF] Controls automatic printout generation when enabled status events occur. Event choices are: ON or OFF. ON enables a printout to be generated by the selected status event. OFF causes no printout when the event occurs. Status event selections are:

SIG_LOSS	:signal loss
SIG_PRESENSE	:signal present
PAT_SYNC	:pattern sync
PAT_LOSS	:pattern loss
FAS_SYNC	:FAS sync
FAS_LOSS	:FAS sync loss
POWER_UP	:power up
ALARM	:alarm transitions
PERF	:transitions to and from unavailable time
FREQ_DRIFT	:Rx frequency out of spec
ALL	:all events

PRINT:STATUS:<event>? Requests the current status print setting for the selected event.

For an automatic printout to occur, PRINT ENABLE must be set to ON, the STATUS EVENT must be set to ON, and the status event must occur.

NOTE: The ALL event cannot be used as a query.

Example:

>PRINT:STATUS:SIGNAL_LOSS ON Enables automatic prints upon a signal loss.

>PRINT:STATUS:SIGNAL_PRESENT? Request the current print status settings for the signal present event.
OFF

TERM

Line Termination	command/query
------------------	---------------

PRINT:TERM [CR|LF|CRLF] Set the printer line terminator. Line termination choices are: CR (carriage return), LF (linefeed), or CRLF (carriage return and linefeed).

PRINT:TERM? Request the selected line terminator.

NOTE: This command only applies to the printer output. Do not confuse the printer terminator with the Program Message Terminator or the Response Terminator of Remote Control. For additional information, see Section 3 of this manual, and the beginning of Section 4.

Example:

>PRINT:TERM LF Sets the line terminator to Line Feed.

>PRINT:TERM? Displays current line terminator.
LF

TIMED

Timed Printouts	command/query
-----------------	---------------

PRINT:TIMED:INTERVAL	Sets the timed print interval for automatic printouts. The time “HH:MM” interval is entered as a string in the format HH:MM within quotes. The allowable time intervals range from 00:01 to 99:59. A setting of 00:00 disables timed prints.
-----------------------------	--

PRINT:TIMED:INTERVAL?	Responds with the current timed print interval setting.
------------------------------	---

PRINT:TIMED:ENABLE	Enables or disables timed prints. Enable choices are: ON or OFF. [ON OFF] ON enables printouts to be generated automatically. The timed interval determines how frequently the printouts occur. OFF disables timed printouts.
---------------------------	--

PRINT:TIMED:ENABLE?	Responds with current timed print enable setting.
----------------------------	---

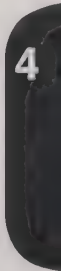
Example:

>PRINT:TIMED:INTERVAL “01:00”	Set to printout each hour.
--	----------------------------

>PRINT:TIMED:INTERVAL? “01:00”	Requests timed print interval.
---	--------------------------------

>PRINT:TIMED:ENABLE? ON	Requests the current timed print enable setting.
--------------------------------------	--

>PRINT:TIMED:ENABLE OFF	Disables the timed print.
-----------------------------------	---------------------------



TYPE**Printout Type****command/query****PRINT:TYPE [SUMM|STD|
LONG|SHORT]**

Selects the results print type. Print type choices are: SUMM (Summary), STD (standard), LONG or SHORT. An example of each printout type is found in Section 3 of this manual.

PRINT:TYPE?

Display current results print format.

Example:

**>PRINT:TYPE?
LONG**

Request current results print format.

>PRINT:TYPE SUMM

Change the format to summary.

WIDTH**Printout Width****command/query****PRINT:WIDTH [40|80]**

Changes the number of characters per line. Width choices are 40 or 80 characters.

PRINT:WIDTH?

Responds with the current printer line width setting.

Set the width to correspond with the size of the printer or CRT being used.

Example:

>PRINT:WIDTH 40

Set width to 40 characters.

4.4.5 Result Commands

The RESULT commands and queries are used to retrieve results from the INTERCEPTOR during a test. In addition to the basic capability to query individual results, it is also possible to capture all of the results in a buffer so that several results can be obtained based on one point in time.

The RESULT commands and queries are:

command:	query:
RESULT:CLEAR	RESULT:<result>?
RESULT:DISPLAY:HOLD	RESULT:DISPLAY:HOLD?
RESULT:DISPLAY:WINDOW1 <result>	RESULT:DISPLAY:WINDOW1?
RESULT:DISPLAY:WINDOW2 <result>	RESULT:DISPLAY:WINDOW2?
RESULT:HOLD	RESULT:HELD:<result>?
RESULT:RESTART	RESULT:RESYNC_SLIP_?
RESULT:RESYNC_SLIP	

RESULT

Result Value	query only
---------------------	-------------------

RESULT:<result-name>? Requests the value of the specified result.

This query requests the current value of the specified result. If the result is not applicable in the current test mode, an execution error occurs and no response is generated. If the result is applicable but not ready yet, a special value is returned to indicate this. This special value is usually -1. See Table 4-12 for a complete list of results and their not-ready values.

Table 4-12
Results and Not-Ready Values

Result:	Not Ready Value:
BIT_ERRS	-1
BER	-1.0E+0
PAT_SLIP	-1
PAT_LOSS	-1
SLIP_SEC	-1
2_CODE	-1
8_CODE	-1
34_CODE	-1
140_CODE	-1
2_CER	-1.0E+0
8_CER	-1.0E+0
34_CER	-1.0E+0

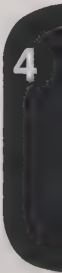


Table 4-12
Results and Not-Ready Values (Continued)

Result:	Not Ready Value:
140_CER	-1.0E+0
CRC_ERR	-1
CRC_E_RT	-1.0E+0
1SEC_CRC	-1
REBEs	-1
2_FAS	-1
8_FAS	-1
34_FAS	-1
140_FAS	-1
2FAS_WD	"NOT READY"
8FAS_WD	"NOT READY"
34FAS_WD	"NOT READY"
140FAS_WD	"NOT READY"
2NFAS_WD	"NOT READY"
2_FER	-1.0E+0
8_FER	-1.0E+0
34_FER	-1.0E+0
140_FER	-1.0E+0
2_FSL	-1
8_FSL	-1
34_FSL	-1
140_FSL	-1
MFSL	-1
CRC_FSL	-1
REBE_FSL	-1
SIG_LOSS	-1
2RXFREQ	-1
8RXFREQ	-1
34RXFREQ	-1
140RXFREQ	-1
2RX_PPM	-32767
8RX_PPM	-32767
34RX_PPM	-32767
140RX_PPM	-32767
2TXFREQ	-1
8TXFREQ	-1
34TXFREQ	-1

Table 4-12
Results and Not-Ready Values (Continued)

Result:	Not Ready Value:
140TXFREQ	-1
TEST_SEC	-1
TIME	"00:00:00"
ELAP_SEC	-1
DATE	"00/00/00"
2M_AIS	NOT_READY
8M_AIS	NOT_READY
34M_AIS	NOT_READY
140M_AIS	NOT_READY
N_2M_AIS	-1
N_8M_AIS	-1
N_34M_AIS	-1
N_140M_AIS	-1
N_TS16_AIS	-1
FAS_DIS	NOT_READY
MFAS_DIS	NOT_READY
TS16_AIS	NOT_READY
8REMOTE	NOT_READY
34REMOTE	NOT_READY
140REMOTE	NOT_READY
N_MFAS_DIS	-1
N_FAS_DIS	-1
N_8REMOTE	-1
N_34REMOTE	-1
N_140REMOTE	-1
PWR_LOSS	-1
AVL_SEC	-1
UNA_SEC	-1
%AVL_SEC	-1.00
ERR_SEC	-1
EFS	-1
%EFS	-1
SES	-1
%SES	-1
DEG_MIN	-1.00
%DEG_MIN	-1
ERR-SES	-1

Table 4-12
Results and Not-Ready Values (Continued)

Result:	Not Ready Value:
BER-SES	-1.0E+0
ABCD_BITS	NOT_READY
Nx_ES	-1
Nx_EFS	-1
Nx_%EFS	-1.00
Nx_DEF S	-1
Nx_SES	-1
Nx_%SES	-1.00
Nx_Av T	-1
Nx_Una T	-1
Nx_%Av T	-1.00
Nx_MRER	-1.0E+0
2M_ES	-1
2M_EFS	-1
2M_%EFS	-1.00
2M_DEF S	-1
2M_SES	-1
2M_%SES	-1.00
2M_Av T	-1
2M_Una T	-1
2M_%Av T	-1.00
2M_MRER	-1.0E+0
8M_ES	-1
8M_EFS	-1
8M_%EFS	-1.00
8M_DEF S	-1
8M_SES	-1
8M_%SES	-1.00
8M_Av T	-1
8M_Una T	-1
8M_%Av T	-1.00
8M_MRER	-1.0E+0
34M_ES	-1
34M_EFS	-1
34M_%EFS	-1.00
34M_DEF S	-1
34M_SES	-1

Table 4-12
Results and Not-Ready Values (Continued)

Result:	Not Ready Value:
34M_%SES	-1.00
34M_Av T	-1
34M_Una T	-1
34M_%Av T	-1.00
34M_MRER	-1.0E+0
140M_ES	-1
140M_EFS	-1
140M_%EFS	-1.00
140M_DEF S	-1
140M_SES	-1
140M_%SES	-1.00
140M_Av T	-1
140M_Una T	-1
140M_%Av T	-1.00
140M_MRER	-1.0E+0

Example:

>RESULT:BIT_ERRS? Request value of bit errors.
-1

CLEAR

Clear Result command only

RESULT:CLEAR Sets all results values to zero.

This command zeros out all results without forcing the receiver to resynchronize. This command is similar to a test restart, but there is no delay while the receiver resynchronizes.

Example:

>RESULT:CLEAR Clears all result values.

DISPLAY:HOLD

Result Display Hold	command/query
----------------------------	----------------------

RESULT:DISPLAY:HOLD [ON OFF]	Controls the display hold status. Display hold choices are: ON or OFF. ON enables the display hold, halting the display of results accumulation. OFF disables the display hold, allowing the display of results accumulation.
---	---

RESULT:DISPLAY:HOLD?	Requests the current state of the display hold.
-----------------------------	---

This command is similar to the front panel DISPLAY HOLD pushbutton.

Example:

>RESULT:DISPLAY:HOLD? OFF	Requests the current setting.
--	-------------------------------

>RESULT:DISPLAY:HOLD ON	Enables the display hold.
-----------------------------------	---------------------------

DISPLAY:WINDOW

Display Results	command/query
------------------------	----------------------

RESULT:DISPLAY:WINDOW1 <result name>	Places the specified result in front panel display window 1. Table 4-12 (previously in this section) lists valid result names.
---	--

RESULT:DISPLAY:WINDOW1?	Request the results information in window 1.
--------------------------------	--

RESULT:DISPLAY:WINDOW2 <result name>	Places the desired result in front panel display window 2.
---	--

RESULT:DISPLAY:WINDOW2?	Request the results information in window 2.
--------------------------------	--

Example:

>RESULT:DISPLAY:WINDOW1? BIT_ERRS	Request which result is displayed in window 1.
--	--

>RESULT:DISPLAY: WINDOW1 BER	Display BER in window 1.
--	--------------------------



HOLD

Result Hold	command only
--------------------	---------------------

RESULT:HOLD Places the current results into the remote control results hold buffer.

This command copies the current results into the remote controls results hold buffer, allowing the user to “freeze” all of the results at a point in time and then read them without the result value changing. Also see **RESULT:HELD**.

Example:

>RESULT:HOLD Places the results in remote control hold buffer

HELD

Result Held	query only
--------------------	-------------------

RESULT:HELD:<result-name>? Reads the specified result from the remote control hold results buffer. This allows results values that have been “frozen” at a point in time to be accessed individually after the **RESULT HOLD** command has been issued. Table 4-9 lists the results names.

Example:

>RESULT:HOLD Store all results in the remote control result hold buffer.

>RESULT:HELD:BIT_ERRS? Gives the number of BIT errors at the time that the **RESULT:HOLD** command was entered.

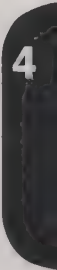
>RESULT:BIT_ERRS? Gives the present number of bit errors.

RESTART

Test Restart	command only
---------------------	---------------------

RESULT:RESTART Restarts the test in progress, re-setting all result values to their zero value.

This command starts a new test by clearing all results and alarms, and forcing the receiver to resynchronize.



Example:

>RESULT:RESTART Restart the test.

RESYNC_SLIP

Result Resync.Slip command/query

RESULT:SLIP_DETECT Controls pattern slip behavior. Slip detection choices [ON|OFF] are ON or OFF. ON enables pattern slips to be detected and counted. OFF disables pattern slip detection and counting. When disabled, pattern slips are not counted, instead a pattern slip results in a burst of bit errors and probably a pattern sync loss.

RESULT:RESYNC_SLIP? Requests the current pattern slip detection setting.

Example:

>RESULT:RESYNC_SLIP? Requests the current pattern slip detection setting.
ON

>RESULT:RESYNC_SLIP OFF Disables pattern slip detection.

STATUS

The STATUS commands and queries are used to set and read the status reporting registers, queues, and buffers. For additional information see Subsection 4.5, Status Registers.

The STATUS commands and queries are:

command:	query:
STATUS:AIS_EN	STATUS:AIS?
	STATUS:AIS_EN?
	STATUS:AIS_HIST?
STATUS:CLEAR_ERR	
STATUS:CLEAR_PR	
	STATUS:ERROR?
	STATUS:LED:ALARMS?
	STATUS:LED:STATUS?
	STATUS:LINE?

command:

STATUS:LINE_EN

STATUS:REM_EN

STATUS:TEST_EN

query:

STATUS:LINE_EN?

STATUS:LINE_HIST?

STATUS:PRINT?

STATUS:REM?

STATUS:REM_EN?

STATUS:REM_HIST?

STATUS:TEST_EN?

STATUS:TEST?

AIS

AIS Register

query only

STATUS:AIS?

Requests the contents of the AIS Register.

Reading the AIS Register returns a bit-weighted value. The value returned is the bit weight of all bits that are high at the time you read the byte. This register always reflects the current status of the received signal. Table 4-13 contains information on each bit and bit weight in the AIS Register.

Table 4-13
AIS Register

Bit:	Weight:	Name:	Meaning:
7	128	-	
6	64	-	
5	32	-	
4	16	140M AIS	140M AIS alarm is active
3	8	34M AIS	34M AIS alarm is active
2	4	8M AIS	8M AIS alarm is active
1	2	2M AIS	2M AIS alarm is active
0	1	TS16 AIS	TS16 AIS alarm is active

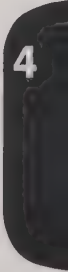
Example:

>STATUS:AIS?

4

Reads the AIS alarm status.

8M AIS alarm is active.



AIS_EN

AIS Enable Register command/query

- STATUS:AIS_EN <mask>

Sets the Line Enable Register bits.
- STATUS:AIS_EN?

Requests the contents of the AIS Enable Register. The value returned is the weight of all bits that are enabled at the time it is read.

The AIS Enable Register contains a mask value for the bits to be enabled in the AIS History Register. When a bit of the AIS History Register is set and its corresponding enable bit is also set, the Alarm Summary bit 1 of Test Summary Register is set. See Table 4-14 for additional information on the AIS Enable Register.

Table 4-14
AIS Enable Register

Bit:	Weight:	Name:	Meaning:
7	128	-	
6	64	-	
5	32	-	
4	16	140M AIS	140M AIS alarm is enabled to set AIS Alarm Summary bit
3	8	34M AIS	34M AIS alarm is enabled to set AIS Alarm Summary bit
2	4	8M AIS	8M AIS alarm is enabled to set AIS Alarm Summary bit
1	2	2M AIS	2M AIS alarm is enabled to set AIS Alarm Summary bit
0	1	TS16 AIS	TS16 AIS alarm is enabled to set AIS Alarm Summary bit

Example:

- >STATUS:AIS_EN 4

Enable 8M AIS alarm to set the AIS Alarm Summary bit of the Status Summary Register.
- >STATUS:AIS_EN?
4

Reads the current register contents.
8M AIS alarm is enabled.

AIS_HIST

AIS History Register query only

- STATUS:AIS_HIST?

Requests the contents of the AIS History Register. Reading the register clears the AIS History Register. Table 4-15 contains information on each bit and bit weight in the AIS History Register.

Reading the AIS History Register returns a bit-weighted value. The value returned is the weight of all bits that are high at the time the byte is read. The bits of this register are set when the corresponding bits in the AIS Register transition from 0 to 1, indicating an alarm has occurred.

Table 4-15
AIS History Register

Bit:	Weight:	Name:	Meaning:
7	128	-	
6	64	-	
5	32	-	
4	16	140M AIS	140M AIS alarm was detected since last reading this register
3	8	34M AIS	34M AIS alarm was detected since last reading this register
2	4	8M AIS	8M AIS alarm was detected since last reading this register
1	2	2M AIS	2M AIS alarm was detected since last reading this register
0	1	TS16 AIS	TS16 AIS alarm was detected since last reading this register

Example:

>STATUS:AIS_HIST?
4

Reads the AIS History Register.
8M AIS alarm has occurred since the last reading of this register.

CLEAR_ERR

Clear Error Queue

command only

STATUS:CLEAR_ERR

This command clears the error message buffer.

Example:

>STATUS:ERROR?
"Unrecognized Command"

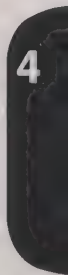
Request the latest error message.

>STATUS:CLEAR_ERR

Clear the error message.

>STATUS:ERROR?
"No Errors"

Request the most recent error message.



CLEAR_PR

Clears Print Buffer command only

STATUS:CLEAR_PR Clear the remote control print buffer.

Example:

>STATUS:CLEAR_PR Clear the RC print queue.

ERROR

Error Buffer query only

STATUS:ERROR? Request the most recent error message from the error buffer. Refer to Subsection 4.6.1 for a complete list of error messages. If no errors are present in the error buffer, the message **No Error** is returned. The response is an error message enclosed in quotes.

Example:

>ASDF Send an unrecognized command.

>STATUS:ERROR? Requests the most recent error message.
"Unrecognized Command"

LED

LED STATUS query only

STATUS:LED:STATUS Requests the status of the green status LEDs. The response is a bit-weighted value with each bit representing an LED. Table 4-16 describes how the LEDs are mapped into these bits.

Table 4-16
Mapping of Status LEDs

Bit:	Weight:	Name:	Meaning:
7	128	PAT SYNC	Unused. Always read as zero
6	64		Unused. Always read as zero
5	32		Represents pattern sync LED

Table 4-16
Mapping of Status LEDs (Continued)

Bit:	Weight:	Name:	Meaning:
4	16	140M FAS SYNC	Represents 140M FAS sync LED
3	8	34M FAS SYNC	Represents 34M FAS sync LED
2	4	8M FAS SYNC	Represents 8M FAS sync LED
1	2	2M FAS SYNC	Represents 2M FAS sync LED
0	1	SIGNAL PRESENT	Represents signal present LED

STATUS:LED:ALARMS?

Requests the state of the red alarm LEDs. The response is a bit-weighted value with each bit representing an LED. Table 4-17 contains information on how the LEDs are mapped into these bits.

Table 4-17
Bit Mapping

Bit:	Weight:	Name:	Meaning:
7	128	PAT SLIP	Represents Pattern Slip LED
6	64	ALARM	Represents Alarms LED
5	32	PAT SYNC	Represents pattern sync loss LED
4	16	140M FAS SYNC	Represents 140M FAS sync loss LED
3	8	34M FAS SYNC	Represents 34M FAS sync loss LED
2	4	8M FAS SYNC	Represents 8M FAS sync loss LED
1	2	2M FAS SYNC	Represents 2M FAS sync loss LED
0	1	SIGNAL PRESENT	Represents signal loss LED

LINE**Line Register****query only****STATUS:LINE?**

Requests the contents of the Line Register. The response is a bit-weighted value. The bits in this register always reflect the current status of the input signal. Table 4-18 contains information on each bit and bit weight in the Line Register.

Table 4-18
Line Register

Bit:	Weight:	Name:	Meaning:
7	128	—	
6	64	ALARM	Set to 1 whenever an alarm is active
5	32	PAT SYNC	Set to 1 when pattern sync is detected
4	16	140M FAS SYNC	Set to 1 when FAS sync is achieved
3	8	34M FAS SYNC	Set to 1 when FAS sync is achieved
2	4	8M FAS SYNC	Set to 1 when FAS sync is achieved
1	2	2M FAS SYNC	Set to 1 when FAS sync is achieved
0	1	SIGNAL PRESENT	Set to 1 when activity is detected at the input

Example:

>STATUS:LINE?

37

Read Line Register.

The value of 37 indicates that the INTERCEPTOR has signal presence, 8M FAS sync, and pattern sync. No alarm is active. (37 = 32 + 4 + 1).

LINE EN

Line Enable Register

command/query

STATUS:LINE_EN <mask>

Sets the Line Enable Register bits.

STATUS:LINE_EN?

Requests the contents of the Line Enable Register. The value returned is the weight of all bits that are enabled at the time the byte was read. This query clears the register after reading it.

The Line Enable Register contains a mask value for the bits to be enabled in the Line History Register. When a bit of the Line History Register is set and its corresponding enable bit is also set, the Signal Summary bit 0 of the Test Summary Register is set. See Table 4-19 for information on the Line Enable Register. For additional information, see Subsection 4.5, Status Registers.

Table 4-19
Status Line Enable Register

Bit:	Weight:	Name:	Meaning:
7	128	PATTERN SLIP	Pattern Slips set the Signal Summary bit
6	64	ALARM	Alarms set the Signal Summary bit
5	32	PAT SYNC	Pattern Sync Loss sets the Signal Summary bit
4	16	140M FAS SYNC	140M FAS Loss sets the Signal Summary bit
3	8	34M FAS SYNC	34M FAS Loss sets the Signal Summary bit
2	4	8M FAS SYNC	8M FAS Loss sets the Signal Summary bit
1	2	2M FAS SYNC	2M FAS Loss sets the Signal Summary bit
0	1	SIGNAL PRESENT	Loss of input signal sets the Signal Summary bit

Example:

- >STATUS:LINE_EN 37

Enables Pattern Sync, 8M FAS Sync, and Signal Present to set the Signal Summary bit.
- >STATUS:LINE_EN?
37

Read the current Line Enable Register.

LINE_HIST

Line History Register

query only

- STATUS:LINE_HIST?

Requests the contents of the Line History Register. Table 4-18 contains information on each bit and bit weight in the Line History Register.

Reading the Line History Register returns a bit-weighted value. The value returned is the weight of the bits that are high at the time the byte is read. Bits 0 to 5 are set when the corresponding bits in the Line Register transition from 1 to 0. This transition indicates a loss of synchronization. Bit 6 is set when the ALARM bit of the Line Register transitions from 0 to 1 indicating an alarm condition. Bit 7 is set when a pattern slip occurs. A non-zero value of this register indicates a history of problems since the last time the register was read. Reading the register resets all bits to zero.

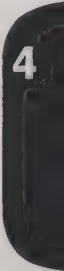


Table 4-20
Line History Register

Bit:	Weight:	Name:	Meaning:
7	128	PATTERN SLIP	A Pattern Slip occurred since the last read
6	64	ALARM	An alarm occurred since the last read
5	2	PAT SYNC	Pattern Sync lost since the last read
4	16	140M FAS SYNC	140M FAS Sync lost since the last read
3	8	34M FAS SYNC	34M FAS Sync lost since the last read
2	4	8M FAS SYNC	8M FAS Sync lost since the last read
1	2	2M FAS SYNC	2M FAS Sync lost since the last read
0	1	SIGNAL PRESENT	Signal presence lost since the last read

Example:

>STATUS:LINE_HIST?
37

Reads the Line History Register.
The value 37 indicates the INTERCEPTOR has lost pattern sync, 8MFAS Sync, and signal presence, since this register was last read. (37 = 32 + 4 + 1).

PRINT

Remote Control Print Buffer

query only

STATUS:PRINT?

Requests the next printout that is in the remote control buffer.
See STATUS:CLEAR_PR, SYSTEM:RC_PRINT, and Sub-section 4.5, Status Reporting, for additional information.

Example:

>SYSTEM:RC_PRINT ON

Enable printing to remote control print buffer.

>PRINT:CONTROLS

Print controls printout.

>*STB?
2

Request the Print Available bit status.

>STATUS:PRINT?

Request printout from the remote control print buffer.

An example of a Printout is as follows:

CONTROLS PRINT		14:22:50 26 Oct 90	
Test Mode	34M	Framing	ON
Coding	HDB3	Pattern	2^15-1
Logic Error	OFF	Log Err Rate	1E-3
FAS Error	OFF	FAS Err Rate	1E-3
Adj FAS Err	1	Code Error	OFF
Code Err Rate	1E-3	Self Loop	ON
Rx Input	TERM	Tx Level	0dB
Timing	INTERNAL	Program #	0
AUXILIARY SETUP			
Printer	OFF	Slip Detect	ON
Error Prints	OFF	Timed Prints	OFF
Status Prints	OFF	Memory Prints	OFF
Print Fmt	STD	Cntrlr Dev	RS232
Printer Dev	NONE	RS232 Baud	9600
RS232 Data bits	8	RS232 Parity	NONE
IEEE488 Address	0		

REM

Remote Alarm Register

query only

STATUS:REM?

Requests the contents of the Remote Alarm Register. Table 4-21 contains information on each bit and bit weight in the Remote Alarm Register.

Reading the Remote Alarm Register returns a bit-weighted value. The value returned is the weight of all the bits that are set at the time the byte is read. This register always reflects the current status of the received signal.

Table 4-21
Remote Alarm Register

Bit:	Weight:	Name:	Meaning:
7	128	-	
6	64	-	
5	32	-	
4	16	140M REMOTE	140M remote alarm is active
3	8	34M REMOTE	34M remote alarm is active
2	4	8M REMOTE	8M remote alarm is active
1	2	MFAS DIS	MFAS Distant remote alarm is active
0	1	FAS DIS	FAS Distant remote alarm is active

Remote Control

Example:

>STATUS:REM? Read remote alarm status.
4 8M remote alarm is active.

REM_EN

Remote Enable Register

command/query

STATUS:REM_EN Sets the Remote Alarm Enable Register bits.

STATUS:REM_EN? Requests the contents of the Remote Alarm Enable Register. See Table 4-22 for information on the Remote Alarm Enable Register

The Remote Enable Register contains a mask value for the bits to be enabled in the Remote History Register. Whenever a bit of the Remote Register is set and its corresponding enable bit is also set, the Remote Alarm Summary bit 2 of the Test Summary register is set. A 1 in the Remote Enable Register enables the corresponding bit in the Remote History Register. A zero disables the bit.

Table 4-22
Remote Alarm Enable Register

Bit:	Weight:	Name:	Meaning:
7	128	-	
6	64	-	
5	32	-	
4	16	140M REMOTE	140M remote alarm is enabled to set the Remote Summary bit.
3	8	34M REMOTE	34M remote alarm is enabled to set the Remote Summary bit.
2	4	8M REMOTE	8M remote alarm is enabled to set the Remote Summary bit.
1	2	MFAS DIS	MFAS Distant remote alarm is enabled to set the Remote Summary bit.
0	1	FAS DIS	FAS Distant remote alarm is enabled to set the Remote Summary bit.

Example:

- >STATUS:REM_EN 4

Enables 8M remote alarm to set Remote Summary Bit.
- >STATUS:REM_EN?
4

Reads the current contents of Remote Enable Register.
8M remote alarm is enabled.

REM_HIST

Remote Alarm History Register

query only

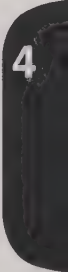
- STATUS:REM_HIST?

Requests the contents of the Remote Alarm History Register. This register is cleared every time it is read.

Reading the Remote Alarm History Register returns a bit-weighted value. The value returned is the bit weight of all bits that are high at the time the byte is read. The bits in this register are set when the corresponding bits in the Remote Alarm Register transition from 0 to 1, indicating a remote alarm has occurred. Table 4-23 contains information on each bit and bit weight in the Remote History Register.

Table 4-23
Remote Alarm History Register

Bit:	Weight:	Name:	Meaning:
7	128	-	
6	64	-	
5	32	-	
4	16	140M REMOTE	140M remote alarm was detected since last reading this register
3	8	34M REMOTE	34M remote alarm was detected since last reading this register
2	4	8M REMOTE	8M remote alarm was detected since last reading this register
1	2	MFAS DIS	MFAS Distant remote alarm was detected since last reading this register
0	1	FAS DIS	FAS Distant remote alarm was detected since last reading this register



Example:

>**STATUS:REM_HIST?** Read Remote Alarm History Register.
4 8M remote alarm has occurred since the last reading of this register.

TEST

Test Summary query

STATUS:TEST? Requests the contents of the Test Summary Register.

Reading the Test Summary Register returns a bit-weighted value. The value returned is the bit weight of all the bits that are high at the time the byte is read. Each of these bits is set according to corresponding Status History and Status Enable Registers. The Test Summary bit is set when one or more enabled bits of a Test Enable Register is set. Table 4-24 contains information on each bit and bit weight in the Test Summary Register.

Table 4-24
Test Summary Register

Bit:	Weight:	Name:	Meaning:
7	128	-	
6	64	-	
5	32	-	
4	16	-	
3	8	-	
2	4	REMOTE ALARM SUMMARY	Summarizes the remote alarm history register
1	2	AIS ALARM SUMMARY	Summarizes the AIS alarm history register
0	1	SIGNAL SUMMARY	Summarizes the line history register

Example:

>**STATUS:TEST?** Reads the Test Summary Register.
2 AIS Alarm Summary bit is set high.

TEST_EN

Test Summary Enable Register command/query

STATUS:TEST_EN Sets the Test Summary Enable Register bits.

STATUS:TEST_EN? Requests the contents of the Test Summary Enable Register.

The Test Summary Enable Register contains a mask value for the bits to be enabled in the Test Summary Register. When a bit of the Test Summary Register is set and its corresponding bit in the Test Summary Enable Register is also set, the Test Summary Status bit 2 of the Status Byte Register is set. See Table 4-25 for information on the Test Summary Enable Register.

Table 4-25
Test Summary Enable Register

Bit:	Weight:	Name:	Meaning:
7	128	-	
6	64	-	
5	32	-	
4	16	-	
3	8	-	
2	4	REMOTE ALARM SUMMARY	Remote Alarm Summary is enabled to set the Test Summary Status bit
1	2	AIS ALARM SIGNAL	AIS Alarm Signal is enabled to set the Test Summary Status bit
0	1	SIGNAL SUMMARY	Signal Summary is enabled to set the Test Summary Status bit

Example:

>STATUS:TEST_EN? Reads the currently enabled condition.
1 Only Signal Summary may set TSS.

>STATUS:TEST_EN 7 Enable Remote Alarm Summary, AIS Alarm Summary, and Signal Summary to set the Test Summary Status bit.



4.4.6 SYSTEM COMMANDS

The SYSTEM commands are used for INTERCEPTOR system-level operations on the INTERCEPTOR. These operations include: clearing NOVRAM, setting time, and assigning the printer device.

The SYSTEM commands and queries are:

command:

SYSTEM:PU_RESTART
SYSTEM:AUDIO
SYSTEM:CLEAR_MEM
SYSTEM:CONTROLLER
SYSTEM:DATE
SYSTEM:IEEE488:ADDR
SYSTEM:LANG
SYSTEM:MEM_PRINT

SYSTEM:MEM_PRINT:CLEAR
SYSTEM:MEM_PRINT:PRINT
SYSTEM:PRINTER
SYSTEM:RC_MODE
SYSTEM:RC_PRINT
SYSTEM:RS232:BAUD
SYSTEM:RS232:DATA
SYSTEM:RS232:PARITY
SYSTEM:RS232:PR40A
SYSTEM:RS232:PR55
SYSTEM:TIME
SYSTEM:PERF
SYSTEM:PERF:CUST:ANOM
SYSTEM:PERF:CUST:DEF
SYSTEM:PERF:CUST:THRESH:SES
SYSTEM:PERF:CUST:THRESH:DM
SYSTEM:SITE_ID
SYSTEM:AUDIO
SYSTEM:RS232:LID
SYSTEM:MEM_USE
SYSTEM:HIST
SYSTEM:HIST:CLEAR

SYSTEM:HIST:TYPE
SYSTEM:HIST:START
SYSTEM:HIST:LENGTH

query:

SYSTEM:PU_RESTART?
SYSTEM:AUDIO?

SYSTEM:CONTROLLER?
SYSTEM:DATE?
SYSTEM:IEEE488:ADDR?
SYSTEM:LANG?
SYSTEM:MEM_PRINT?
SYSTEM:MEM_PRINT:CAPACITY?

SYSTEM:PRINTER?
SYSTEM:RC_MODE?
SYSTEM:RC_PRINT?
SYSTEM:RS232:BAUD?
SYSTEM:RS232:DATA?
SYSTEM:RS232:PARITY?
SYSTEM:RS232:PR40A?
SYSTEM:RS232:PR55?
SYSTEM:TIME?
SYSTEM:PERF?
SYSTEM:PERF:CUST:ANOM?
SYSTEM:PERF:CUST:DEF?
SYSTEM:PERF:CUST:THRESH:SES?
SYSTEM:PERF:CUST:THRESH:DM?
SYSTEM:SITE_ID?
SYSTEM:AUDIO?

SYSTEM:MEM_USE?
SYSTEM:HIST?

SYSTEM:HIST:FULL?
SYSTEM:HIST:TYPE?
SYSTEM:HIST:START?
SYSTEM:HIST:LENGTH?

command:

SYSTEM:HIST:AUTO_LEN
SYSTEM:HIST:RESULT
SYSTEM:CHECKSUM

query:

SYSTEM:HIST:AUTO_LEN?
SYSTEM:HIST:RESULT?

AUDIO

Beeper Control	command/query
-----------------------	----------------------

SYSTEM:AUDIO [ON OFF]	Controls the beeper. Audio choices are: ON or OFF. ON enables the side panel volume control to adjust the audio loudness. OFF disables the beeper. The side panel control cannot adjust the volume. The beeper is always re-enabled at power-up.
------------------------------	--

SYSTEM:AUDIO?	Requests the current beeper status.
----------------------	-------------------------------------

Example:

>SYSTEM:AUDIO? ON	Request current audio state.
--------------------------------	------------------------------

>SYSTEM:AUDIO OFF	Disable the beeper until the SYSTEM:AUDIO ON command is sent or until power is cycled.
-----------------------------	---

CLEAR_MEM

Clear Memory	command only
---------------------	---------------------

SYSTEM:CLEAR_MEM	Clears all information in NOVRAM and returns all settings to the factory default settings. See Appendix C for a listing of factory default settings.
-------------------------	--

This is a very powerful command that should be used with caution. Information erased includes user-programmable patterns, the ten stored instrument setups, and the current instrument configuration. This command is similar to the Clear Memory operation on the front panel, except that several settings are not cleared so that remote control operation is not interrupted. These settings are the RC and printer device selections, the RS-232 settings and the IEEE-488 address.

NOTE: The RS-232 RC operation reverts to computer mode operation.

Example:

>SYSTEM:CLEAR_MEM	Clears non-volatile RAM.
-----------------------------	--------------------------



CONTROLLER

Controller Selection	command /query
----------------------	----------------

SYSTEM:CONTROLLER <device>	Sets the remote control device. Controller selections are: RS232, IEEE488, or NONE. RS232 selects the RS-232 Interface as the control port. IEEE488 selects the IEEE-488 Interface as the control port. NONE disables both the RS-232 and IEEE-488 Interfaces. The INTERCEPTOR is then only operable using the front panel.
---	---

SYSTEM:CONTROLLER?	Requests the current controller device selection.
---------------------------	---

Use this command with extreme care, since changing the controller device can make the INTERCEPTOR incompatible with the remote device being used. If the INTERCEPTOR is currently controlled using the IEEE-488 bus, the **SYSTEM:CONTROLLER RS232** command relinquishes control from the IEEE-488 Interface to the RS232 port. The IEEE-488 Interface no longer responds to commands across the IEEE-488 bus.

Example:

>SYSTEM:CONTROLLER? IEEE488	Request current controller device.
>SYSTEM:CONTROLLER NONE	Disables both the RS-232 and IEEE-488 Interfaces.

DATE

Date	command/query
------	---------------

SYSTEM:DATE "DD MMM YY"	Sets the date. The date is entered as a quoted string in the format "DD/MMM/YY" in which DD is the day (01-31), MMM is the month (JAN-DEC) and YY is the year (00-99).
--------------------------------	--

SYSTEM:DATE?	Requests the date. The date is reported in a quote-enclosed string in the format "DD MMM YY", where DD is the day (01-31), MMM is the month (JAN - DEC), and YY is the year (00-99).
---------------------	--

Example:

>SYSTEM:DATE "1 FEB 90"	Sets the date to February 1, 1990.
>SYSTEM:DATE? "01 FEB 90"	Responds with the current date.

HIST

Histogram Data Storage and Printing

command/query

These commands control how the Histogram prints operate. They provide the same function as the Histogram print commands on the INTERCEPTOR front panel.

NOTE: In order to select Histograms for memory usage, the **SYSTEM:MEM_USE** command must be set to HIST.

- SYSTEM:HIST [ON|OFF]

Selects Histogram Print as the desired results print.
- SYSTEM:HIST?

Requests the current status of Histogram data storage.
- SYSTEM:HIST:CLEAR

Clears all previously stored Histogram data.
- SYSTEM:HIST:FULL?

Requests how full the histogram storage buffer is. A response 65 of 100 indicates that the buffer is full. A response of 0 indicates that the buffer is empty. If the buffer is partially full, the response will be a number between 0 and 100. The “65” represents the percentage of the Histogram Buffer that is full.
- SYSTEM:HIST:TYPE

Determine the Histogram format. The choices are Graph, Text, and List.
- SYSTEM:HIST:START
[“BEGIN” “DD|HH:MM”]

Sets the length of time to be shown on the X-axis of the histogram print. The time may be set by specifying an interval in DD/HH:MM format or by specifying END which automatically sets the interval to the maximum time possible.
- SYSTEM:HIST:LENGTH
SYSTEM:HIST:AUTO_LEN

Select the length of the Histogram being recorded.
- SYSTEM:HIST:RESULT

Select which result is to be used to make a histogram print. See Table 4-26 for a listing of valid choices.
- SYSTEM:HIST:RESULT?

Requests the current histogram result selection

Table 4-26
Histogram Results Selections

Selection:	Description:	Selection:	Description:
140_SES	M.550 140M SES	N_140_REM	140M Rem alarm count
34_SES	M.550 34M SES	N_34_REM	34M Rem alarm count

Table 4-26
Histogram Results Selections (Continued)

Selection:	Description:	Selection:	Description:
8_SES	M.550 8M SES	N_2_REM	8M Rem alarm count
2_SES	M.550 2M SES	N_2_REM	2M Rem alarm count
NX_SES	M.550 Nx64k SES	N_MFAS_DIS	MFAS DIS alarm count
140_ES	M.550 140M ES	140_FAS	140M FAS errors
34_ES	M.550 34M ES	34_FAS	34M FAS errors
8_ES	M.550 8M ES	8_FAS	8M FAS errors
2_ES	M.550 2M ES	2_FAS	2M FAS errors
NX_ES	M.550 Nx64k ES	PAT_LOSS	Pattern Losses
140_UNA T	M.550 140M Una T	BIT_ERR	Bit Errors
34_UNA T	M.550 34M Una T	PAT_SLIP	Pattern Slips
8_UNA T	M.550 8M Una T	CRC_ERR	CRC Errors
2_UNA T	M.550 2M Una T	140_CODE	140M Code Errors
NX_UNA T	M.550 Nx64k Una T	34_CODE	34M Code Errors
SES	G.821 SES	8_CODE	8M Code Errors
ERR_SEC	G.821 Errored Sec	2_CODE	2M Code Errors
UNA_SEC	G.821 Una Sec	ALL	All results
SIG_LOSS	Signal Losses		
N_140 AIS	140M AIS count		
N_34 AIS	34M AIS count		
N_8 AIS	8M AIS count		
140_FSL	140M FAS losses		
34_FSL	34M FAS losses		
8_FSL	8M FAS losses		
2_FSL	2M FAS losses		
2_MFSL	MFAS losses		
CRC_FSL	CRC FAS losses		

Example:

>SYSTEM:HIST?

ON

Check to see if histogram storage is on.

It was on.

>SYSTEM:HIST OFF

Turn off histogram storage.

>SYSTEM:HIST:FULL?

65

See how much data has been stored.
The buffer is 65% full.

- >SYSTEM:HIST:START "BEGIN" Start it at the beginning of stored data.
- >SYSTEM:HIST:LENGTH "END" Graph the entire time storage was on.
- >SYSTEM:HIST:RESULT
CODE_ERRS Select code errors to be graphed.
- >SYSTEM:HIST:TYPE GRAPH Select the "Graph" type of print.
- >SYSTEM:HIST: Print it on the printer.
- >SYSTEM:HIST:CLEAR Clear the entire histogram storage buffer.

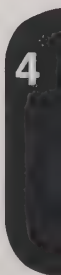
IEEE488:ADDR	
IEEE-488 Address	command/query
SYSTEM:IEEE488:ADDR <number>	Set the INTERCEPTOR IEEE-488 address. IEEE-488 address selections are: 00 through 30.
SYSTEM:IEEE488:ADDR?	Request the INTERCEPTOR IEEE-488 address.

Changing the IEEE-488 address while in remote control can cause control problems, since it affects the way the INTERCEPTOR interacts with the controller.

Example:

- >SYSTEM:IEEE488:ADDR 3 Set the INTERCEPTOR address to 3.
- >SYSTEM:IEEE488:ADDR?
3 Request the current INTERCEPTOR IEEE-488 address.

LANGUAGE	
Display Language	command/query
SYSTEM:LANG [ENGLISH FRCAIS]	Set the INTERCEPTOR display language. The language choices are: ENGLISH (English) or FRCAIS (French).
SYSTEM:LANG?	Requests the INTERCEPTOR display language.



Remote Control

Example:

- >SYSTEM:LANG ENGLISH Set the INTERCEPTOR display language to English.
- >SYSTEM:LANG?
ENGLISH Request the display language the INTERCEPTOR is using.

MEM_PRINT

Memory Print	command/query
SYSTEM:MEM_PRINT [ON OFF]	Control the memory print capability. Memory print choices are: ON or OFF. ON enables memory prints; OFF disables the memory print capability.
SYSTEM:MEM_PRINT?	Request the status of the memory print capability.
SYSTEM:MEM_PRINT:PRINT	Generate a printout of the printouts stored in memory print buffer.
SYSTEM:MEM_PRINT:CLEAR	Clear the memory print buffer.
SYSTEM:MEM_PRINT: CAPACITY?	Request the available capacity of the memory print buffer.

These commands are similar to the Memory Print Auxiliary Function.

Example:

- >SYSTEM:MEM_PRINT?
ON Check memory print setting.
- >SYSTEM:MEM_PRINT:PRINT Generate a printout of the printouts stored in the memory print buffer.
- >SYSTEM:MEM_PRINT:CLEAR Clear memory print buffer.
- >SYSTEM:MEM_PRINT:
CAPACITY?
100 Request available capacity of memory print buffer.
Memory print buffer is completely empty.

MEM_USE**Memory Store Use****command/query****>SYSTEM:MEM_USE [HIST
| MEM_PRINT]**

Selects whether histogram storage or memory print storage may be used.

>SYSTEM:MEM_USE?

Requests the current status of the mem_use selection.

These commands select how the non-volatile memory buffer will be used — for Memory Prints or for Histogram data storage. This command is equivalent to the Memory Store page on the front panel.

Example:

>SYSTEM:MEM_USE?

Check to see how mem_use is set.

MEM_PRINT

Memory prints are enabled (Histogram storage disabled.)

>SYSTEM:MEM_USE HIST

Enable histogram storage. (Disables memory print storage.)

PRINTER**Printer Selection****command/query****SYSTEM:PRINTER <device>**

Selects the printer device. Printer device choices are: RS232, IEEE488, or NONE. RS232 selects the RS-232 port for printouts. IEEE-488 selects the IEEE-488 port for printouts. NONE disables the printer output.

SYSTEM:PRINTER?

Requests the printer device setting.

Example:

**>SYSTEM:PRINTER?
RS232**

Responds with current printer device.

PU_RESTART

Power Up Restart command/query

SYSTEM:PU_RESTART[ON|OFF] Selects whether a test restart will be performed when the unit powers on.

SYSTEM:PU_RESTART? Requests whether the unit will perform a test restart when it powers up again.

These commands control how the unit handles test results when it loses power. When power returns, it can either perform a test restart, thus clearing the test results, or it can not perform a test restart and instead just continue the test from its original place.

Example:

>SYSTEM:PU_RESTART? See if Results will be cleared when power is lost. In this case, results
ON will be cleared.

>SYSTEM:PU_RESTART OFF Set Restart on Power Up to OFF, so a test restart will not be done at power up.

RC_MODE

Remote Control Mode command/query

SYSTEM:RC_MODE Control the INTERCEPTOR remote control mode. Remote control
[TERM|COMP] choices are: TERM or COMP. TERM selects terminal mode, for use
with a dumb terminal. COMP selects computer mode, designed for use with a
programmed controller.

SYSTEM:RC_MODE? Request the current remote control mode of operation.

For additional information on terminal and computer mode see Section 4.2.2 and 4.2.3.

Example:

>SYSTEM:RC_MODE? Request the remote control mode.
TERM

>SYSTEM:RC_MODE COMP Put the INTERCEPTOR into computer mode.

NOTE: RC Mode only applies to RS-232 Remote Control. When using IEEE-488, remote control is always in computer mode.

RC_PRINT

Remote Control Printout	command/query
--------------------------------	----------------------

SYSTEM:RC_PRINT [ON|OFF] Control remote control printouts. Remote control print selections are: ON or OFF. ON enables printing to the remote control print queue. OFF disables printing to the remote control print queue.

SYSTEM:RC_PRINT? Request the remote control printout status.

For additional information see STATUS:PRINT and Subsection 4.5, Status Reporting.

Example:

>SYSTEM:RC_PRINT? Check the current state of the prints to Remote Control Print queue.
OFF

>SYSTEM:RC_PRINT ON Enable printing to the Remote Control Print queue.

RS232

RS232 Interface Control	command/query
--------------------------------	----------------------

SYSTEM:RS232:BAUD [300|1200|2400|4800|9600] Select the RS232 baud rate. Baud rate selections are: 300, 1200, 2400, 4800, or 9600.

SYSTEM:RS232:BAUD? Request the RS232 baud rate.

SYSTEM:RS232:DATA [7|8] Select the RS232 data bits. Data bit selections are: 7 or 8.

SYSTEM:RS232:DATA? Request the RS232 data bits.

SYSTEM:RS232:PARITY [EVEN|ODD|NONE] Set the RS232 parity. Parity choices are: EVEN, ODD, or NONE.

SYSTEM:RS232:PARITY? Request the RS232 parity.

SYSTEM:RS232:PR55 Set the RS232 baud rate, data bits, and parity to match the PR-55 lid printer.

SYSTEM:RS232:PR40A Set the RS232 baud rate, data bits, and parity to match the PR40A printer.

Use these commands to configure the RS-232 Interface to the proper baud rate, number of data bits, and parity. The queries enable the user to determine the current settings for these parameters.

Remote Control

Example:

- >SYSTEM:RS232:BAUD 9600 Set the baud rate to 9600.
- >SYSTEM:RS232:PARITY?
NONE Request current parity setting.
- >SYSTEM:RS232:PR55 Set the baud rate, data bits, and parity to match the PR-55 lid printer.

SITE_ID

Site Identifier	command/query
>SYSTEM:SITE_ID "PARIS"	Assign an alphanumeric name to the site under test. Sets the site identification for the INTERCEPTOR 1402.
>SYSTEM:SITE_ID? PARIS	Requests the site identification for the INTERCEPTOR 1402. (It's Paris).

These commands allow one to set and read the unit's Site Identification. This Site Identification will appear on all printouts to provide a permanent record of where a set of measurements were taken.

Example:

- >SYSTEM:SITE_ID "PARIS" Set site identification to PARIS.
- >SYSTEM:SITE_ID?
PARIS Checks the site identification (It's PARIS).

TIME

Time	command/query
SYSTEM:TIME "HH:MM:SS"	Set the time. The time is entered as a quote-enclosed string, in 24-hour format: HH(00-23):MM(00-59):SS(00-59).
SYSTEM:TIME?	Request the current time. The time is returned in 24-hour format, enclosed in quotes.

Example:

- >SYSTEM:TIME?
"22:31:51"

Requests the current time.
- >SYSTEM:TIME "12:45:55"

Sets the time to 12:45:55.

PERFORMANCE

Performance Analysis Mode	command/query
SYSTEM:PERF [G821 M550_IN M550_OUT CUSTOM]	Select the performance analysis mode. Performance analysis selections are: G.821, M550_IN, M550_OUT, or CUSTOM. G.821 selects the out-of-service performance requirements specified. specified by G.821. M550_IN selects the in-service performance requirements specified by M550. M.550_OUT selects the out-of-service performance requirements specified by M.550. CUSTOM permits the user to specify the M.550 threshold levels for M.550 performance analysis.
SYSTEM:PERF?	Requests the current performance analysis selection.

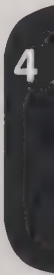
Example:

- >SYSTEM:PERF?
CUSTOM

Requests the current performance analysis selection.

PERFORMANCE

Customize Anomalies	command/query
SYSTEM:PERF:CUST: ANOM X, Y	Allows customizing of the M.550 anomaly items, where X is the anomaly item (BIT, FAS, CODE, CRC, or AIS) and Y is the anomaly status (ON or OFF)
SYSTEM:PERF:CUST: ANOM? X	Requests the current status of anomaly X, where X is the anomaly item (BIT, FAS, CODE, CRC, or AIS).



Example:

>SYSTEM:PERF:CUST:

ANOM? AIS
ON

Requests current status of AIS anomaly. Response indicates that AIS anomaly is enabled to cause error seconds.

PERFORMANCE

Customize Defects

command/query

SYSTEM:PERF:CUST:
DEF X, Y

Allows customizing of the M.550 defect items, where X is the defect item (SIG_LOSS, FAS_SYNC, ALARM, or PAT_SYNC) and Y is the anomaly status (ON or OFF)

SYSTEM:PERF:CUST:
DEF? X

Requests the current status of defect X, where X is the defect item (SIG_LOSS, FAS_SYNC, ALARM, or PAT_SYNC)

Example:

>SYSTEM:PERF:CUST:

DEF? PAT SYNC
ON

Requests the current status of the Pattern Sync Defect. Response indicates the Pattern Sync Defect is enabled to cause Severely Errorred Seconds.

PERFORMANCE

Customize SES Threshold

command/query

SYSTEM:PERF:CUST:
THRESH:SES X, Y

Allows customizing of the M.550 SES (Severely Errorred Second) threshold for any anomaly item, where X is the anomaly item (2_FAS, 2_CODE, 2_CRC, 8_FAS, 8_CODE, 8_FAS, 34_CODE, 34_FAS, 140_CODE, or 140_FAS) and Y is the threshold in anomalies (1 to 999999) per second.

SYSTEM:PERF:CUST:
THRESH:SES? X

Requests the current SES threshold for anomaly X, where X is the anomaly item (2_FAS, 2_CODE, 2_CRC, 8_FAS, 8_CODE, 8_FAS, 34_CODE, 34_FAS, 140_CODE, or 140_FAS).

Example:

>SYSTEM:PERF:CUST:
THRESH:SES? 2_CRC
830

Requests the current SES anomaly threshold for 2M CRCs.

4.4.7 TOP LEVEL COMMANDS

The TOP LEVEL commands are used to set functions of the INTERCEPTOR that are not grouped with other commands. These functions include setting: self loop, receive input selection, and the output level.

The TOP LEVEL commands and queries are:

command:	query:
LOCAL	LOCKED?
LOCKOUT	
OUT_LEVEL	OUT_LEVEL?
RCV_INPUT	RCV_INPUT?
RCV_INPUT:MON34	RCV:INPUT:MON34?
RCV_INPUT:GAIN	RCV_INPUT:GAIN?
SELF_LOOP	SELF_LOOP?
TIMING	TIMING?
UNLOCK	

LOCAL

Local Mode (RS-232 ONLY)	command only
--------------------------	--------------

LOCAL	Enter Local mode.
-------	-------------------

This command causes the INTERCEPTOR to return to local mode, making the front panel switches active. The INTERCEPTOR will remain in local mode until it receives a valid remote control command from the controller. This command is not valid when using the IEEE-488 Interface. With the IEEE-488 Interface the Go-To-Local (GTL) bus-level command performs a similar function. See your controller documentation.

Example:

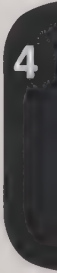
>LOCAL	Enter Local (front panel) mode.
--------	---------------------------------

LOCKOUT

Front Panel Lockout (RS-232 Only)	command only
-----------------------------------	--------------

LOCKOUT	Locks out the front panel, disabling front panel control.
---------	---

UNLOCK	Unlocks the front panel ENTER switch. Pressing the ENTER switch allows front panel control again.
--------	---



LOCKED? Requests the front panel lockout status. A value of 0 indicates that the user can press the **ENTER** key to restore front panel operation.

See the LOCAL command.

These commands are not valid when using the IEEE-488 Interface. The bus-level local-lockout (LLO) command performs a similar function with the IEEE-488 Interface.

Example:

- >LOCKOUT** Prevents anyone from using the front panel.
- >LOCKED?** Request the lock status.
1
- >UNLOCK** Pressing the **ENTER** key on the front panel restores front panel operation.

OUT_LEVEL

Output Setting	command/query
----------------	---------------

- | | |
|-----------------------------|--|
| OUT_LEVEL [0 -6 -12] | Select the output level. Output level selections are: 0, -6, or -12. |
| OUT_LEVEL? | Display the current output level setting. |

Example:

- | | |
|-----------------------------|-------------------------------|
| >OUT_LEVEL?
-6 | Request current output level. |
| >OUT_LEVEL -12 | Set output level to -12 dB. |

NOTE: The output level is automatically set to 0 dB when 140M output is selected and cannot be changed until another output frequency is selected.

RCV_INPUT

Receive Input **command/query**

RCV_INPUT
[MON|BRIDGE|TERM]

Select the receive input setting. Receive input selections are: MON (monitor), BRIDGE, or TERM (terminated). MON provides 75/120 ohms impedance to signals that have been resistively attenuated by a monitor point. BRIDGE provides greater than 1000 ohms input impedance for lines that are already terminated. TERM provides 75/120 ohms impedance for a signal having cable loss.

RCV_INPUT? Request the current receive input setting.

RCV_INPUT:MON34
[RES|RES+CABLE]

Set the receive input compensation for the MON input at 34M. 34M monitor point selections are: RES or RES+CABLE. RES provides gain for a transmission point close to a monitor point. RES+CABLE provides gain and cable equalization for 15 meters of cable.

RCV_INPUT:MON34? Request the 34M MON input compensation selection.

NOTE: These above commands may only be used when the MONGAIN level is not present. installed.

[RCV_INPUT:GAIN [20 | 23 | 26 | 30]

Select the nominal gain to be used for monitor mode input.

RCV_INPUT:GAIN? Request the current monitor gain setting.

NOTE: These commands may only be used when the MONGAIN level is available.

Example:

>RCV_INPUT? Request current receive input status.
MON

>RCV_INPUT TERM Change the receive input source to TERM.

NOTE: The BRIDGE selection cannot be used with the 140M receive frequency.

SELF_LOOP

Self Loop	command/query
SELF_LOOP [ON OFF]	Select the SELF LOOP status. SELF LOOP choices are: ON or OFF. ON enables the self loop. OFF disables the self loop.
SELF_LOOP?	Request the current self loop status.
Example:	
>SELF_LOOP? OFF	Request the self loop status.
>SELF_LOOP ON	Set the INTERCEPTOR to SELF LOOP mode.

TIMING

Transmit Timing Source	command/query
TIMING [REC INT EXT]	Select the transmit timing source. Timing selections are: REC (recovered), INT (internal), or EXT (external). REC recovers the transmit timing from the received data stream. INT uses the INTERCEPTOR internal clock as the transmit timing source. EXT accepts an external transmit timing source at the BNC connector.
TIMING?	Display the current transmit timing source.
Example:	
>TIMING? INT	Display the transmit timing source.
>TIMING EXT	Change the transmit timing source to an external clock source.

4.5 STATUS REPORTING

The INTERCEPTOR 1402 uses a set of internal registers, queues, and buffers to store information about test status, line conditions, alarms, error conditions, and printer data. The user may access this information by using INTERCEPTOR 1402 queries.

4.5.1 Register Operation

The INTERCEPTOR has six groups of registers: Status Byte Register, Event Status Register, Test Summary Register, Remote Alarms Register, AIS Alarms Register, and Line History Register. See Figure 4-1.

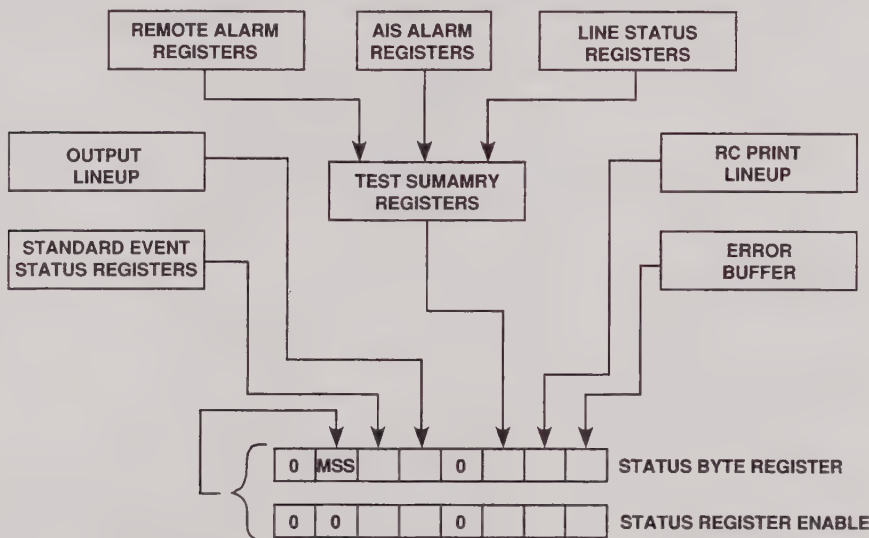


Figure 4-1
INTERCEPTOR Registers

Each group of registers captures specific events. Within each group of registers is a status register composed of 8 bits representing up to 8 events. When a specific event occurs the corresponding bit is set to 1. The user may read each status register and interpret the bits, to provide test status information.

Each group of registers contains one writable eight bit enable register. The user may program the bits in each enable register to report selected events in the corresponding status register. Setting the bits in the enable register controls the generation of the summary bit for each register group. The summary bit is set when a status register bit and its corresponding enable register bit are both set.

Users may read registers using an associated query. Users may use an associated command to write a value to enable registers. The ***CLS** command clears all event registers, buffers, and queues except the output queue.

Register Operation Example

In Figure 4-2, the value 36 has been written to Enable Register 1. This value sets bits 2 and 5 of Enable Register 1. Since bit 5 of both Status Register 1 and Enable Register 1 is set, the summary bit is set.

This process is duplicated with each group of registers until all of the summary information is directed to the Status Byte register. The information contained in the Status Byte register enables the SRQ signal on the IEEE-488 bus. The SRQ signal provides a flexible way for programmers to have the INTERCEPTOR signal when an event of interest occurs.

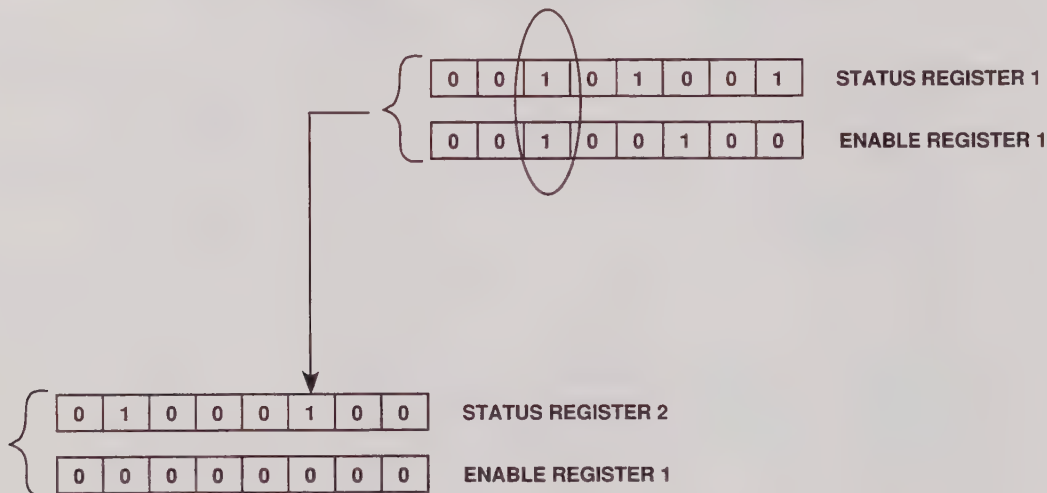


Figure 4-2
Register Operation

4.5.2 Queue and Buffer Operation

All responses the INTERCEPTOR generates are placed in the Output Queue. With RS-232 Remote Control operation the contents of the Output Queue are immediately transmitted to the terminal. In IEEE-488 Remote Control operation, responses are stored in the Output Queue until the INTERCEPTOR is addressed to TALK. When a response is in the Output Queue the Message Available indicator bit 6 of the Status Byte Register is set to 1.

Printouts generated by the INTERCEPTOR may be sent to an internal buffer called the RC Print Queue. An available print in the RC Print Queue sets the Print Available indicator bit 6 of the Status Byte Register to 1. This ability is enabled through the command **SYSTEM:RC_PRINT**. Users may read the printouts by using the **STATUS:PRINT?** query.

The Error Buffer is an internal buffer used to store the last generated error message. The Error Buffer is read using the **STATUS:ERROR?** query and is cleared using the **STATUS:CLEAR_ERR** command. When an error message is present in the Error Buffer, the Error Available indicator, bit 0 of the Status Byte Register, is set to 1. Error messages are also transmitted directly to the terminal in RS-232 terminal mode operation.

4.5.3 Status Byte Register Group

The Status Byte Register group summarizes the data structures reporting to it, and consists of two, eight-bit registers: Status Byte Register and Status Byte Enable Register. See Figure 4-3.

The Status Byte Register contains summary bits from the data structures that report to it. Each bit reports whether a specific event or condition has occurred. The INTERCEPTOR defines six of the eight bits in the Status Byte Register, the other two bits are always set to zero.

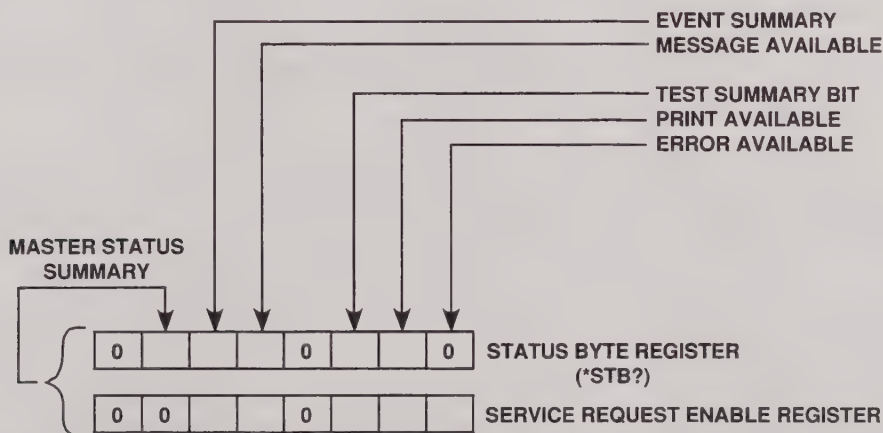


Figure 4-3
Status Byte Register

The controller reads the Status Byte Register by using a serial poll or the ***STB** query. If the Status Byte Register is read using a serial poll, bit 6 is returned as a Request Service (RQS); if it is read with a ***STB?** query, bit 6 is returned as a Master Summary Status (MSS).

When the Status Byte Register is read, a binary-weighted integer is returned. This integer represents the decimal equivalent of the enabled bits in the register. Convert the returned value to binary to determine the status of the bits in the Status Byte Register.

- Bit 7 Always zero. Not defined.
- Bit 6 MSS - Master Status Summary
Represents the summary of all other bits in the Status Byte Register. The corresponding enabling bit in the Service Request Enabling Register (***SRE**) is not programmable. When this bit is set to 1, an SRQ is asserted on the IEEE-488 bus.
- Bit 5 ESB - Event Status Bit
Indicates that an enabled event in the Standard Event Status Register has occurred. Read the Standard Event Status Register to determine which event has occurred.
- Bit 4 MAV - Message Available
Indicates that a response is available in the output queue. The INTERCEPTOR will not talk on an IEEE-488 bus until the MAV bit is set to 1.
- Bit 3 Always zero. Not defined.
- Bit 2 Bit 2 indicates that an enabled event in the Test Summary Register has occurred. Read the Test Summary Register to determine which event has occurred.
- Bit 1 PAV - Print Available
Indicates that a printout is available in the remote control print queue. See **SYSTEM:RC_PRINT** and **STATUS:PRINT?**
- Bit 0 EAV - Error Message Available
Indicates that an error message is available in the error buffer. See **STATUS:ERROR?** and **STATUS:CLEAR_ERR**.

The Status Byte Enable Register is an 8-bit register that determines which bits of the Status Byte Register can cause the MSS bit 6 of the Status Byte Register to be set. The MSS bit is used to assert SRQ when using an IEEE-488 bus. This means that the Service Request Enable register effectively determines when the INTERCEPTOR will request service. The Service Request Enable Register is written to with the ***SRE** command.

4.5.4 Event Status Register Group

The Event Status Register group is used to detect specific IEEE-488.2 defined events, and consists of two, eight-bit registers: Event Status Register and Event Status Enable Register. See Figure 4-4.

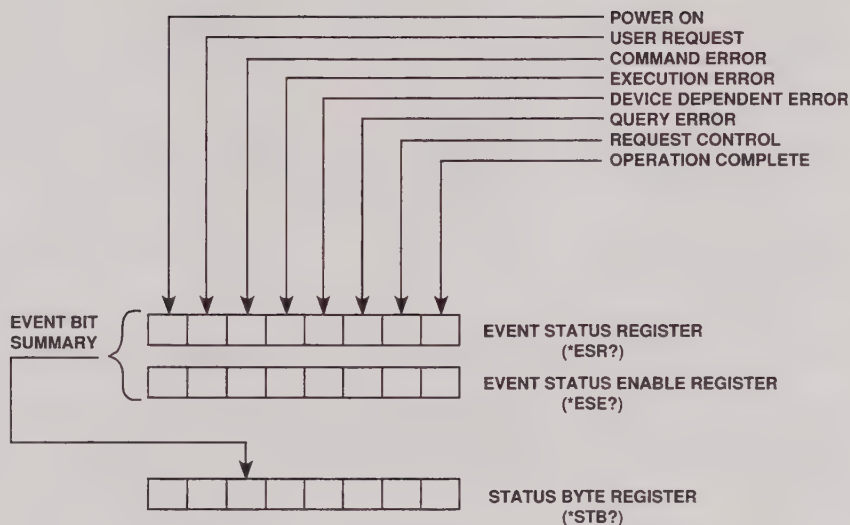


Figure 4-4
Event Status Register Group

The Event Status Register (ESR) assigns specific IEEE-488.2 defined events to each of the bits within the register. A bit is set in the Event Status Register when the event that corresponds to that bit has occurred since the register was last read or cleared. This register is cleared each time it is read.

- | | |
|-------|--|
| Bit 7 | PON - Power On
Power has been cycled OFF and ON since the last time the Event Status Register was read. |
| Bit 6 | URQ - User Request
Not used. Always reads zero. |
| Bit 5 | CME - Command Error
Indicates that a command received by the INTERCEPTOR was not executed because it was not understood. |
| Bit 4 | EXE - Execution Error
Indicates that the INTERCEPTOR is unable to execute a command. |

- Bit 3 DDE - Device Dependent Error
Not used. Always reads zero.
- Bit 2 QYE - Query Error
Indicates that the controller has attempted to read the INTERCEPTOR output queue when nothing was available to be read, or that data in that queue has been lost.
- Bit 1 RQC - Request Control
Not used. Always reads zero.
- Bit 0 OPC - Operation Complete
Reports that all pending operations are complete. See the ***OPC** common command.

The Event Status Enable Register (ESE) is an eight bit register that allows the controller to enable or disable each bit in the Event Status Register. When a bit in the Event Status Enable Register is set to 1, the corresponding bit in the Event Status Register is enabled. When an enabled bit in the Event Status Register is set to 1, the ESB bit in the Status Byte Register is also set to 1.

4.5.5 Test Summary Register Group

The Test Summary Register is an eight bit register that contains summary bits from the data structures reporting to it. Figure 4-5 depicts this register. In this example, only three of the eight bits are used.

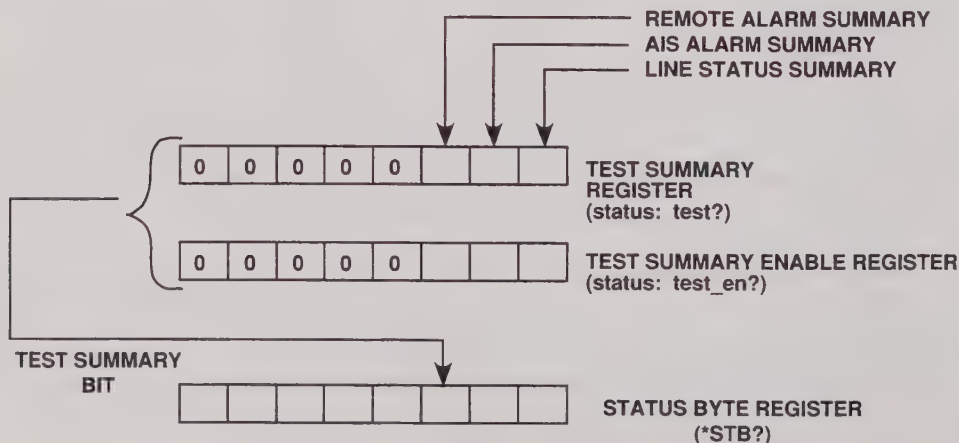


Figure 4-5
Test Summary Register

Bit 7	Not defined. Always zero.
Bit 6	Not defined. Always zero.
Bit 5	Not defined. Always zero.
Bit 4	Not defined. Always zero.
Bit 3	Not defined. Always zero.
Bit 2	Remote Alarm Summary Bit
Bit 1	AIS Alarm Summary Bit
Bit 0	Line Status Summary Bit

4.5.6 Remote Alarm Register Group

The Remote Alarm Register group is used to detect remote alarms, and consists of three registers: Remote Alarm Register, Remote Alarm History Register, and Remote Alarm Enable Register. See Figure 4-6.

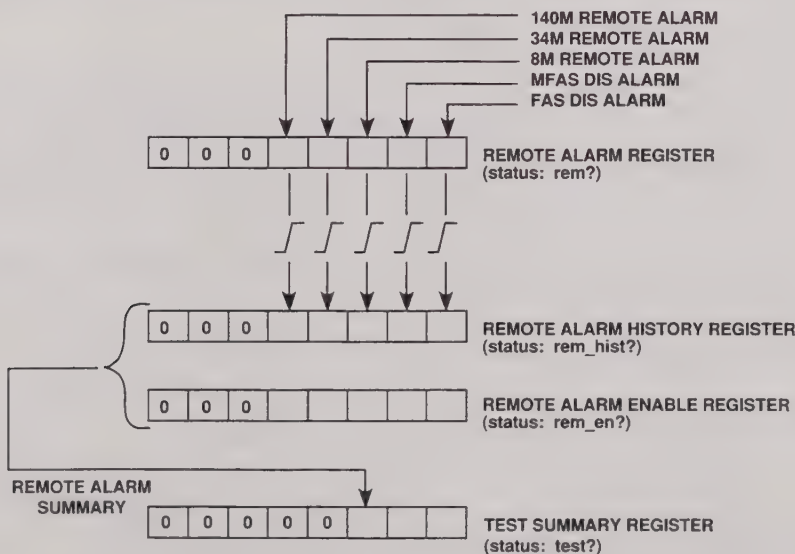


Figure 4-6
Remote Alarm Register Group

Remote Control

The Remote Alarm Register indicates the current alarm status. A 1 in any bit position indicates that the corresponding alarm is currently active. The Remote Alarm Register is read with the query, **STATUS:REM?**. The bit grouping is as follows:

Bit 7	Not used. Always set to zero.
Bit 6	Not used. Always set to zero.
Bit 5	Not used. Always set to zero.
Bit 4	140 REMOTE Indicates that 140M remote alarm is active.
Bit 3	34 REMOTE Indicates that 34M remote alarm is active.
Bit 2	8 REMOTE Indicates that 8M remote alarm is active.
Bit 1	MFAS DIS Indicates that MFAS Distant alarm is active.
Bit 0	FAS DIS Indicates that FAS Distant alarm is active.

The Remote Alarm History Register provides the history of remote alarms since the last time this register was read or since the last test restart. A bit in this register is set when the corresponding bit in the Remote Alarm Register transitions from 0 to 1. Once set, the bit in the Remote Alarm History Register remains set until the register is read. A set bit in this register indicates that a remote alarm has occurred since last reading the register. A bit that is not set indicates that no alarms have occurred during the interval since this register was last read.

The Remote Alarm History Register is read with the query, **STATUS:REM_HIST?**. This register is automatically cleared each time it is read. The bit grouping is as follows:

Bit 7	Not used. Always set to zero.
Bit 6	Not used. Always set to zero.
Bit 5	Not used. Always set to zero.
Bit 4	140 REMOTE Indicates that 140M remote alarm has occurred since last reading this register.
Bit 3	34 REMOTE Indicates that 34M remote alarm has occurred since last reading this register.

- Bit 2 8 REMOTE
Indicates that 8M remote alarm has occurred since last reading this register.
- Bit 1 MFAS DIS
Indicates that MFAS Distant alarm has occurred since last reading this register.
- Bit 0 FAS DIS
Indicates that FAS Distant alarm has occurred since last reading this register.

The Remote Alarm Enable Register determines how the Remote Alarm Summary bit of the Test Summary Register is set. The Remote Alarm Summary bit is set when the corresponding bits in the Remote Alarm Enable Register and Remote Alarm History Register are set.

The Remote Alarm Enable Register is written using the command, **STATUS:REM_EN**. It is read with the query **STATUS:REM_EN?**.

4.5.7 AIS Alarm Register Group

The AIS Alarm register group is used to detect AIS alarms, and consists of three registers: AIS Alarm Register, AIS Alarm History Register, and AIS Alarm Enable Register. Figure 4-7 depicts the AIS Alarm Register Group.

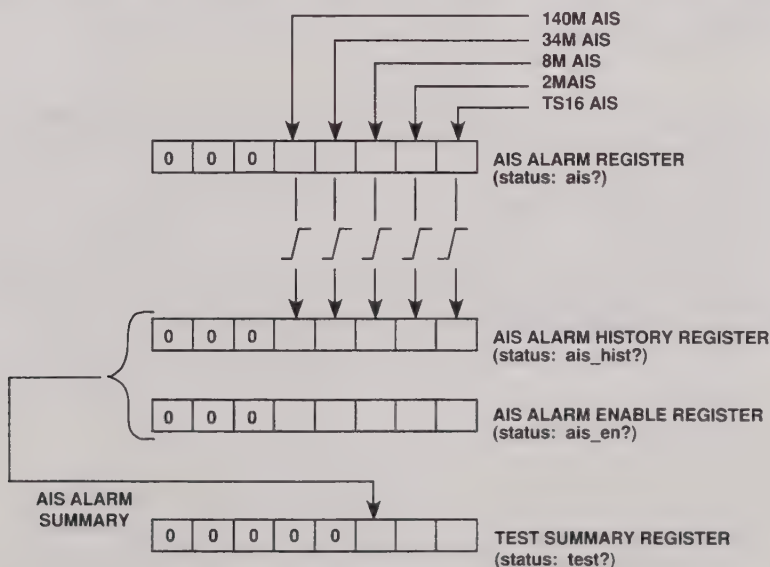


Figure 4-7
AIS Alarm Register Group

Remote Control

The AIS Alarms Register always indicates the current alarm status. A one in any bit position indicates that the corresponding alarm is currently active. The AIS Alarm Register is read with the query, **STATUS:AIS?**. The bit grouping is as follows:

Bit 7	Not used. Always set to zero.
Bit 6	Not used. Always set to zero.
Bit 5	Not used. Always set to zero.
Bit 4	140 AIS Indicates the 140M AIS alarm is active.
Bit 3	34 AIS Indicates the 34M AIS alarm is active.
Bit 2	8 AIS Indicates the 8M AIS alarm is active.
Bit 1	2 AIS Indicates the 2M AIS alarm is active.
Bit 0	TS16 AIS Indicates the TS16 AIS alarm is active.

The AIS Alarm History Register provides the history of the AIS alarms since the last time this register was read or the last test restart. A bit in this register is set when the corresponding bit in the AIS Alarms Register transitions from 0 to 1. Once set, the bit in the AIS History Register remains set until this register is read. A set bit in this register indicates that an AIS alarm has occurred since last reading this register. A bit that is not set indicates that no alarms have occurred during the interval since this register was last read.

The AIS Alarm History Register is read with the query, **STATUS:AIS_HIST?**. This register is automatically cleared after each time it is read. The bit grouping is as follows:

Bit 7	Not used. Always set to zero.
Bit 6	Not used. Always set to zero.
Bit 5	Not used. Always set to zero.
Bit 4	140 AIS Indicates the 140M AIS alarm has occurred since last reading this register.
Bit 3	34 AIS Indicates the 34M AIS alarm has occurred since last reading this register.
Bit 2	8 AIS Indicates the 8M AIS alarm has occurred since last reading this register.
Bit 1	2 AIS Indicates the 2M AIS alarm has occurred since last reading this register.
Bit 0	TS16 AIS Indicates the TS16 AIS alarm has occurred since last reading this register.

The AIS Alarm Enable Register determines how the AIS Alarm Summary Bit of the Test Summary Register is set. The AIS Alarm Summary Bit is set when the corresponding bits in the AIS Alarm History Register and the AIS Alarm Enable Register are set.

Using the command, **STATUS:AIS_EN** allows you to write to the AIS Alarm Enable Register. It is read with the query **STATUS:AIS_EN?**.

4.5.8 Line Status Register Group

The Line Status register group consists of three registers: Line Status Register, Line History Register, and Line Enable Register. See Figure 4-8. This group of registers is used to detect the state of the signal presence indicator, the various FAS Sync indicators, the pattern slip indicator, and an alarm indicator.

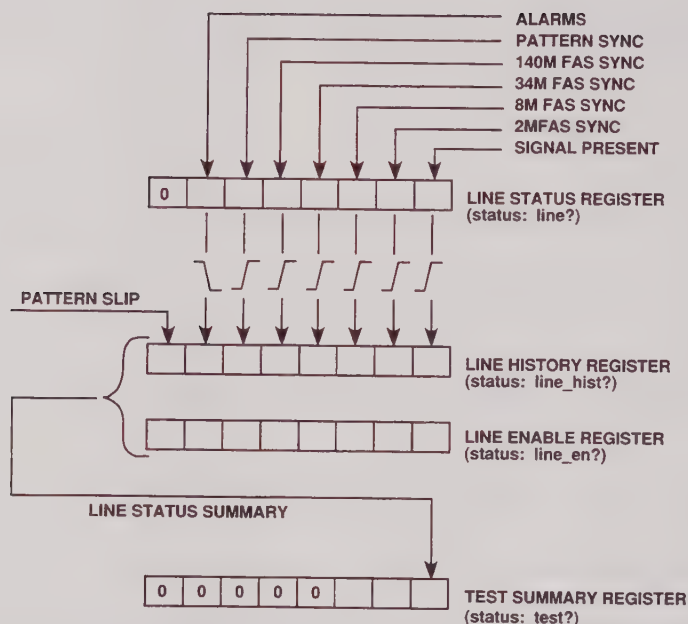


Figure 4-8
Line Status Register Group

The Line Status Register gives the current state of the signal presence indicator, the various FAS Sync indicators, the pattern slip indicator, and an alarm indicator. The Line Status Register is read with the query, **STATUS:LINE?**. The bit grouping is as follows:

- Bit 7 Not used. Always set to zero.
- Bit 6 ALARM
Set to one when any alarms are active.
- Bit 5 PATTERN SYNC
Set to one when the INTERCEPTOR has detected pattern sync.
- Bit 4 140M FAS SYNC
Set to one when the INTERCEPTOR has detected 140M FAS Sync.

Bit 3	34M FAS SYNC Set to one when the INTERCEPTOR has detected 34M FAS Sync.
Bit 2	8M FAS SYNC Set to one when the INTERCEPTOR has detected 8M FAS Sync.
Bit 1	2M FAS SYNC Set to one when the INTERCEPTOR has detected 2M FAS Sync.
Bit 0	SIGNAL PRESENT Set to one when the INTERCEPTOR detects that an input signal is present.

The Line History Register provides the history of the signal presence indicator, various FAS Sync indicators, pattern slip indicator, and the alarm indicators since the Line History Register was last read. A set bit generally indicates an error has occurred or Synchronization was lost during the interval since the register was last read.

The Line History Register is read using the query, **STATUS:LINE HIST?**.

Bit 7	PATTERN SLIP Indicates that a pattern slip occurred since this register was last read.
Bit 6	ALARM Indicates that an alarm occurred since this register was last read.
Bit 5	PATTERN SYNC Indicates that pattern sync was lost since this register was last read.
Bit 4	140M FAS SYNC Indicates that 140M FAS Sync was lost since this register was last read.
Bit 3	34M FAS SYNC Indicates that 34M FAS Sync was lost since this register was last read.
Bit 2	8M FAS SYNC Indicates that 8M FAS Sync was lost since this register was last read.
Bit 1	2M FAS SYNC Indicates that 2M FAS Sync was lost since this register was last read.
Bit 0	SIGNAL PRESENT Indicates that signal presence was lost since this register was last read.

The Line Enable Register is used to determine how the Line Status Summary bit of the Test Summary Register is set. The Line Status Summary bit is set when corresponding bits in the Line History Register and the Line Enable Register are set.

4.6 REMOTE CONTROL ERROR MESSAGES

An error message indicates that the INTERCEPTOR has found an error with a remote control command and, therefore, did not process it. The INTERCEPTOR remote control mode of operation (RS-232 terminal, RS-232 computer, or IEEE-488) determines how error messages are generated. Following is a description of remote control error messages for these modes.

RS-232 Terminal Mode

In terminal mode, the INTERCEPTOR operates interactively. Error messages are transmitted to the terminal as soon as they occur. The error message is also placed in the error buffer, causing the Error Available indicator (bit 0 of the Status Byte Register) to be set.

RS-232 Computer Mode

In computer mode, the INTERCEPTOR operates with a programmed computer which requires predictable results from the INTERCEPTOR. Error messages are not sent to the computer when they occur, but are sent to the error buffer which causes the Error Available indicator (bit 0 of the Status Byte Register) to be set.

IEEE-488 Operation

When the INTERCEPTOR is operated via an IEEE bus, error messages are sent to the error buffer, which causes the Error Available indicator (bit 0 of the Status Byte Register) to be set.

The error buffer holds one error message at a time. The error message currently held is the last error message generated. Users may read the error buffer by using the **STATUS:ERROR?** query, and the buffer is cleared using the **STATUS:CLEAR_ERR** command. Whenever an error message is present in the error buffer, the Error Available indicator (bit 0 of the Status Byte Register) is set.

4.6.1 Error Messages

The following is a complete list of possible error messages reported by the INTERCEPTOR.

Argument Out of Range

Cause: An enable register is set to a value outside the range of 0 to 255.

Argument Too Long

Cause: An invalid argument is given to a command.

Frame Bit Results Not Supported

Cause: An attempt was made to select frame bit based results in a unit which can only support frame word based results.

Histograms Not Enabled

Cause: An attempt to print histograms when they were not enabled.

IEEE-488 Option Not Installed

Cause: An IEEE-488 related command was given, but the IEEE-488 option is not installed.

Illegal Histogram Result

Cause: An attempt to set the histogram result improperly

Illegal Mode

Cause: An attempt to select mux mode using an instrument which does not support mux mode (e.g. INTERCEPTOR 1400).

Illegal While TS16 Framing Is Enabled

Cause: An attempt to select timeslot 16 as a transmit or receive tributary when TS16 signalling multiframing is ON.

Incorrectly Formed Histogram Length

Cause: An improper histogram length was specified. Valid values are of the form "DD/HH:MM"

Incorrectly Formed Histogram Start Time

Cause: An improper histogram start time was specified. Valid values are of the form "DD/HH:MM"

Invalid Anomaly

Cause: An invalid anomaly was specified to the system:perf:cust:anom command or query.

Invalid Coding

Cause: Either the 2/8/24M coding was set to CMI, or the 140M coding was set to HDB3, AMI, or RZ. These combinations are illegal.

Invalid Error Rate

Cause: An invalid error insertion rate was specified. Valid rates are 1.OE-3, 1.OE-4, 1.OE-5, and 1.OE-6. Note that these rates must be given exactly as they appear here.

Invalid FAS Result Type

Cause: An invalid parameter was given to system:fas_err

Invalid Monitor Level

Cause: An invalid monitor setting was given to rcv_input:mon34

Invalid Parity Setting

Cause: An invalid value was specified for the RS-232 interface parity setting. Valid values are ODD, EVEN, or NONE.

Invalid Performance Category

Cause: An invalid parameter was given to system:perf

Invalid Receive Input Selection

Cause: An invalid value was specified for rcv_input. Valid values are MON, BRIDGE, and TERM.

Invalid Site Id

Cause: An illegal site identifier was given to system:site_id

Invalid Threshold Value

Cause: An invalid threshold value was passed to system:perf:cust:thresh:ses

Invalid Argument

Cause: A command was issued with an argument that did not match the expected argument syntax.

Invalid Baud Rate

Cause: A baud rate other than 300, 1200, 2400, 4800, or 9600 was set using the SYSTEM:RS232:BAUD command.

Invalid Date

Cause: The data given is not in the correct format MM/DD/YY.

Invalid Error Insertion State

Cause: The error insertion state was set to something other than ON or OFF.

Invalid IEEE-488 Address

Cause: The IEEE-488 address was set outside the range of 0 to 30.

Invalid Mux Setup

Cause: The multiplexer input, analysis, and output rates were set to an illegal combination of values.

Invalid Number of Adjacent Errors

Cause: The adjacent frame error setting was set outside the range of 1 to 4.

Invalid Number of Data Bits

Cause: The RS-232 port data bits were set to something other than 7 or 8.

Invalid Numeric Argument

Cause: The INTERCEPTOR 1402 does not recognize the argument entered in the command line, since it is not in a numeric format.

Invalid Output Level

Cause: The output level was set to a value other than 0, -6, or -12.

Invalid Parity Setting

Cause: The RS-232 port parity was set to something other than NONE, EVEN, or ODD.

Invalid Printer Enable State

Cause: The printer enable setting was set to something other than ON or OFF.

Invalid Printer Width

Cause: The printer width was set to a value other than 20, 40, or 80.

Invalid Symbol In Pattern

Cause: The programmable user pattern was entered with symbols other than 0 or 1.

Invalid Time

Cause: The time was set to an invalid value.

Invalid Timed Print Period

Cause: The timed print interval was not set to a valid time. A valid time is entered in the format HH:MM where HH range equals 0 to 23 and MM range equal 0 to 59.

Invalid Tributary

Cause: The demultiplexed tributary was set to a value other than 1, 2, 3, or 4. The multiplexed tributary was set to a value other than 1, 2, 3, 4, or ALL.

Length Must Be >0

Cause: An attempt to set the histogram length to zero

Memory Print Functions Not Available

Cause: An attempt was made to use memory prints while the memory store was set to histogram.

No Memory For Print Request

Cause: A request to print a histogram failed because there was no memory in the print queue.

No Such Event During Specified Time

Cause: An attempt to print a histogram was ignored because no recordable events occurred during the specified time interval.

Nx64 Option Not Installed

Cause: A command requiring an Nx64k option was attempted but the Nx64k option is not installed.

Option Not Installed

Cause: A 140M related command was issued, but the 140M Option is not installed.

Remote Control

Pattern Too Long

Cause: A programmable data pattern was entered that contained more than 24 bits.

Pattern Too Short

Cause: A programmable data pattern was entered that contained less than 3 bits.

Print Buffer Is Empty

Cause: The command was issued to read the print buffer when no printouts were available.

Print Buffer Full

Cause: The print buffer has reached its maximum capacity. Attempts to generate printouts will fail.

Printer and Controller Can't Be Same Device

Cause: Either the RS-232 or IEEE-488 Interface was assigned to both the printer and the remote control functions.

REBE's Not Supported

Cause: An attempt was made to request the REBE count with a unit that is not upgraded to support this.

Recall Number Out of Range

Cause: The *RCL command received an argument outside the range of 0 to 9.

Result Not Available

Cause: A result was read that is not valid in the current test mode.

Start Time Must Be <= Elapsed Time

Cause: An attempt was made to print a histogram over a time interval that extends beyond what has been recorded.

Start Time Must Be <= Stored Time

Cause: An attempt was made to print a histogram over a time interval that extends beyond what has been recorded.

String Argument Expected

Cause: A command was issued without the argument enclosed in quotes.

String Too Long

Cause: A command with a string of more than 254 characters was entered.

Syntax Error

Cause: The INTERCEPTOR does not recognize the input as a valid command. This could be the result of a missing semicolon or comma, or a misspelled command.

Unknown Histogram Print Type

Cause: An invalid parameter was passed to system:hist:type

Unrecognized Alarm

Cause: An invalid transmit alarm was specified as a parameter.

Unrecognized ABCD Pattern

Cause: An invalid ABCD bit pattern was specified as a parameter.

Unrecognized Anomaly State

An invalid ON/OFF parameter was specified to the system:perf:cust:anom command.

Unrecognized Audio State

Cause: An invalid parameter was given to system:audio

Unrecognized Clock Polarity

Cause: An invalid clock polarity was specified. Valid clock polarities are INVERT and NORMAL

Unrecognized Defect State

Cause: An invalid ON/OFF parameter was specified to the system:perf:cust:def command.

Unrecognized Fill

Cause: An invalid Nx64k fill pattern selection was specified. Valid fill selections for Nx64k are IDLE or ONES.

Unrecognized Histogram Buffer Action

Cause: An invalid histogram action was specified in the command system:hist. Valid actions are ON, OFF, and CLEAR.

Unrecognized Idle Pattern

Cause: An invalid idle code pattern was specified.

Unrecognized Language

Cause: An invalid language was specified as a parameter

Unrecognized Memory Use State

Cause: An invalid language was specified as a parameter.

Unrecognized NFAS Word

Cause: An invalid NFAS word was specified as a parameter.

Unrecognized Result Name

Cause: An invalid result name was given to result:display>windowN.

Remote Control

Unrecognized Rx/Tx Coupling

Cause: An invalid parameter was given to mode:mux:nx64:tie.

Unrecognized Status Print State

Cause: An invalid parameter was passed to a print:status:XXX command.

Unrecognized Timed Print State

Cause: An invalid parameter was passed to a print:status:XXX command.

Unrecognized Timeslot

Cause: An invalid timeslot number was given as a parameter

Unrecognized Timeslot State

An invalid parameter was passed to a print:timed:enable

Unrecognized 2M I/O Format

Cause: The 2M I/O format was set to something other than 75 or 120.

Unrecognized Coding

Cause: The coding was set to something other than HDB3, AMI, RZ, NRZ, or CMI.

Unrecognized Command

Cause: An unrecognizable command or query was received.

Unrecognized CRC4 State

Cause: The CRC4 state was set to something other than ON or OFF.

Unrecognized Device

Cause: The printer or remote control device was set to something other than IEEE488, RS232, or NONE.

Unrecognized Display Hold State

Cause: The display hold state was set to something other than ON or OFF.

Unrecognized Error Print State

Cause: The error print state was set to something other than ON or OFF.

Unrecognized Fill Pattern

Cause: The mux fill pattern was set to something other than RND or ONES.

Unrecognized Framing

Cause: The framing was set to something other than ON or OFF.

Unrecognized Memory Print State

Cause: The memory print state was set to something other than ON or OFF.

Unrecognized Mode

Cause: The mode was set to a value other than 2M, 8M, 34M, 140M, or MUX.

Unrecognized Pattern

Cause: The pattern was set to an invalid value. Pattern must be set to either MARK, ONES, SPACES, 1:1, 1:3, 1:4, 2^6-1, 2^9-1, 2^11-1, 2^15-1, 2^20-1, 2^23-1, or PROGRAM.

Unrecognized Print Type

Cause: The print type was set to something other than STD, SUMM, or LONG.

Unrecognized Printer Terminator

Cause: The print line terminator was set to something other than CR, LF, or CRLF.

Unrecognized Rate

Cause: The MUX input, analysis, and output rate were set to values other than 2M, 8M, 34M or 140M.

Unrecognized Receive Input Selection

Cause: The receive input was set to something other than TERM, MON, or BRIDGE.

Unrecognized Remote Control Mode

Cause: The remote control mode was set to something other than TERM or COMP.

Unrecognized Self Loop State

Cause: The status print enable was set to something other than ON or OFF.

Unrecognized Timed Print State

Cause: The timed print state was set to something other than ON or OFF.

Unrecognized Timing Mode

Cause: The timing mode was set to something other than INT, EXT, or REC.

Unrecognized Audio State

Cause: The audio enable state was set to something other than ON or OFF.

Unrecognized Result Name

Cause: An invalid result name was issued with the RESULT:DISPLAY:WINDOW command.

Unrecognized TS16 State

Cause: The TS16 state was set to something other than ON or OFF.

SECTION 5 OPTIONS AND ACCESSORIES

5.1 INTRODUCTION

This section contains information concerning options and accessories available for use with the INTERCEPTOR 1402 Communications Analyzer.

5.2 OPTIONS

Table 5-1 lists options available for use with the INTERCEPTOR 1402.

**Table 5-1
INTERCEPTOR 1402 Options**

Option No.:	Description:
1402-1	140 Mbit/s Interface
1402-2	IEEE-488/IEC-625 Remote Control Interface
1402-3	Precision Time Base (± 1 ppm)
1402-4	PR-55 Lid Printer
1402-5	Nx64K Interface

5.2.1 140 Mbit/s Option

The 140 Mbit/s option enables the INTERCEPTOR to operate at the 140 Mbit/s (139.264 Mbit/s) data rate. With the 140M interface installed, the **TEST MODE** switch can select the 140M test mode. Selecting the 140M test mode allows multiplexers, demultiplexers, and circuits operating at 140 Mbit/s to be tested.

5.2.2 IEEE-488/IEC-625 Printer/Controller Interface

The IEEE-488/IEC-625 Printer/Controller Interface allows the INTERCEPTOR to provide printouts to an IEEE-488 printer, or to be controlled by an IEEE-488 remote controller. Selection of the IEEE-488/IEC-625 Printer/Controller Interface for printouts or as the remote controller is accomplished through the use of the auxiliary menus.

5.2.3 Precision Time Base

The Precision Time Base Option provides increases the accuracy of frequency measurement. With the Precision Time Base Option installed, the frequency measurement accuracy is increased from ± 5 ppm to ± 1 ppm.

5.2.4 Nx64K Interface

The Nx64K Interface provides the ability to access, test, and generate any contiguous or non-contiguous Nx64K or Nx56K timeslots for data or voice within the network. This interface also provides 600 Ω access for TIMS testing.

5.2.5 PR-55 Lid Printer

The PR-55 Lid Printer is a serial, dot matrix, 40-character, thermal printer. The PR-55 Lid Printer replaces the INTERCEPTOR 1402 lid. The PRINTER connector on the INTERCEPTOR front panel provides printer power. When the INTERCEPTOR is configured for operation with the PR-55 (the RS-232 auxiliary menu), controls, results, and timed printouts can be generated.

5.3 ACCESSORIES

Table 5-2 lists accessories available for use with the INTERCEPTOR 1402.

Table 5-2
INTERCEPTOR 1402 Accessories

10213	RS-232/V.24 male-to-male cable (6')
10418	RS-232/V.24 male-to-male cable (10')
30687	3-pin banana-to-3-pin banana cable (6')
30761	3-pin banana-to-bantam plug (6')
PR-55	Lid printer
PR-40A	Thermal graphics printer
PR-35	Rack-mounted thermal printer
10966	Thermal printer paper (10 rolls)
30771	Printer cable
41444-01	Rack mount 19" (48.26 cm)
41444-02	Rack mount extension kit 19" to 23" (48.26 cm to 58.42)
41306	Soft carrying case
ML-11660	Replacement operating manual
11255	Handset

SECTION 6 MAINTENANCE AND SERVICE

6.1 INTRODUCTION

This section contains information on maintenance and service for the INTERCEPTOR 1402, including TTC's warranty policies and repair procedures.

6.2 MAINTENANCE

6.2.1 In Case of Difficulty

If the unit fails to operate and no front or rear panel indicators illuminate, check the following:

- AC power cord connection
- AC fuse and fuse rating
- Power applied to the unit

If some indicators illuminate but the unit fails to operate, verify that all circuit boards are properly inserted and making good physical contact (turn off the power before inserting or removing the boards).

Follow the self-test procedures in Section 3 of this operating manual as an aid in localizing the problem. If the unit continues to be inoperative, refer to the following sections for service information or call the TTC distributor for applications assistance.

6.3 SERVICE

6.3.1 Warranty Policy

All equipment manufactured by Telecommunications Techniques Corporation (TTC) is warranted against defects in material and workmanship. This warranty applies only to the original purchaser and is non-transferable unless express written authorization of the warranty transfer is granted by TTC.

Liability under this warranty extends only to the replacement value of the equipment. The warranty is void under the following conditions:

1. Equipment has been altered or repaired without specific authorization from TTC.
2. Equipment is installed other than in accordance with instructions contained in TTC literature and operating manuals.

No other warranty is expressed or implied. TTC is not liable for consequential damages.

6.3.2 In-Warranty Service

Equipment in warranty must be returned to the factory or authorized service center with shipping prepaid. The equipment should be packed and shipped in accordance with instructions in Section 6.3.4 of this manual. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the nearest TTC Repair Center. The RA number should then appear on all paperwork and be clearly marked on the outside of the shipping container.

After TTC repairs the equipment, it will be tested to applicable specifications, burned-in for at least 24 hours, retested, and returned to the customer with shipping prepaid. A brief description of the work performed and the materials used will be provided on the Equipment Repair Report furnished with the returned equipment.

6.3.3 Out-of-Warranty Service

The procedure for repairing out-of-warranty equipment is the same as that used for equipment still in warranty. However, there is a minimum charge applied to each request for out-of-warranty service. The minimum charge guarantees the customer an estimate of the repair costs and is used as credit against actual materials and labor costs should the equipment be repaired. Contact the nearest TTC Repair Center for specific information on the minimum out-of-warranty charge.

The customer will be billed for parts plus standard labor rates in effect at the time of repair. The customer will also be required to furnish a purchase order number before repair work can be started, and TTC (or the authorized service center) must receive a hard copy of the purchase order before the repaired equipment may be shipped to the customer. A description of the labor and materials used will be provided in the Equipment Repair Report.

Once an out-of-warranty repair is made, the repaired part or component is warranted for 90 days. This warranty applies only to the part or component that was repaired; other parts or components are not covered under the 90-day repair warranty.

6.3.4 Equipment Return Instructions

To all equipment returned for repair, the customer should attach a tag that includes at least the following information:

1. Owner's name and address.
2. A list of the equipment being returned and the applicable serial number(s).
3. A detailed description of the problem or service requested.
4. The name and telephone number of the person to contact regarding questions about the repair.
5. The Return Authorization (RA) number.

If the INTERCEPTOR 1402 is being returned, it is recommended that all switches be left in the positions they were in when the problem occurred.

If possible, the customer should return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. TTC is not liable for any damage that may occur during shipping. The customer should clearly mark the TTC-issued RA number on the outside of the package and ship it prepaid and insured to TTC.

Send package to:

**Telecommunications Techniques Corporation
Attn: INTERCEPTOR Repair
20400 Observation Drive
Germantown, Maryland USA 20876**

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APPENDIX A MESSAGES

A.1 OVERVIEW

This appendix describes the messages visible in the INTERCEPTOR 1402 display windows, as well as messages that are printed out. Table A-1 lists the display messages and the cause for the message. Table A-2 lists the status messages printed out.

A.2 DISPLAYED MESSAGES

In addition to providing menu and results information, the display windows also display messages. These messages provide information to the user concerning setup and testing. A message is considered to be either persistent (repeatedly flashed until the cause of the condition is cleared) or non-persistent (displayed once for approximately 4 seconds). Table A-1 lists the messages that the INTERCEPTOR displays.

Table A-1
Displayed Messages

INVALID RCV FREQUENCY	This persistent message is flashed indicating that an invalid receive frequency has been detected.
AUTOBAUD IN PROGRESS	This persistent message is flashed when autobaud is being initiated. Once autobaud is complete, the message is cleared.
RCV DATA INVERTED	This persistent message is flashed indicating the received data is of the opposite polarity from what is expected to be received. This message only persists until the user presses any key on the front panel.
INVALID SETUP	This non-persistent message is displayed for approximately 4 seconds on the bottom line of the display window. Selecting an analysis frequency that is greater than the input or output frequency causes this message to be displayed. It is necessary to select an analysis frequency that is equal to or less than the input or output frequency.

Table A-1
Displayed Messages (Continued)

EXTERNAL TX CLOCK USED	This non-persistent message is displayed when MUX TEST is enabled, TIMING is set to RECOV (recovered), and the transmit frequency is higher than the input frequency. In this configuration, the recovered clock can not be used at the transmit rate and the unit will automatically use either the internal or external clock, depending on whether activity is detected on the external clock input. This message indicates that the external clock was chosen.
INTERNAL TX CLOCK USED	This non-persistent message is displayed when MUX TEST is enabled, TIMING is set to RECOV (recovered), and the transmit frequency is higher than the input frequency. In this configuration, the recovered clock can not be used at the transmit rate and the unit will automatically use either the internal or external clock, depending on whether activity is detected on the external clock input. This message indicates that the internal clock was chosen.
LBO NOT AVAILABLE AT 140M	This non-persistent message is displayed when LBO is attempted to be selected when 140M mode is enabled.

A

A.3 STATUS MESSAGES

In addition to the messages visible in the display window, status messages are printed out to an attached printer. Status messages print out when the corresponding auxiliary menu item is enabled (set to ON) and the printer is on. See Section 3 of this manual for the Status Print Menu. A status printout is generated when the enabled status condition occurs. The change that caused the printout to be generated is printed first, followed by the date and time the change occurred. Table A-2 lists the status changes that cause printouts to be generated when they are enabled.

Table A-2
Status Messages

2M FAS Sync Gain
2M FAS Sync Loss
2M MFAS Sync Gain
2M MFAS Sync Loss
8M FAS Sync Gain
8M FAS Sync Loss
34M FAS Sync Gain
34M FAS Sync Loss

Table A-2
Status Messages (Continued)

140M FAS Sync Gain
140M FAS Sync Loss
Nx Pat Sync Gain
Nx Pat Sync Loss
2M Pat Sync Gain
2M Pat Sync Loss
8M Pat Sync Gain
8M Pat Sync Loss
34M Pat Sync Gain
34M Pat Sync Loss
140M Pat Sync Gain
140M Pat Sync Loss
Last Power Down
Power On
Signal Present
Signal Loss
Print Squelch On
Print Squelch Off
2Mppm out of range
8Mppm out of range
34Mppm out of range
140ppm out of range
Processing Histograms - Please Wait
Histogram Print
No Data in Specified Range
G.821 Available
G.821 Unavailable
M.550 Nx64 Av T
M.550 Nx64 Una T
M.550 2M Av T
M.550 2M Una T
M.550 8M Av T
M.550 8M Una T
M.550 34 M Av T
M.550 34M Una T
M.550 140M Av T
M.550 140M Una T
2M AIS Alm ON
8M AIS Alm ON

Table A-2 (Continued)
Status Messages

34M AIS Alm ON
140M AIS Alm ON
TS16 AIS Alm ON
FAS DIS Alm ON
MFAS DIS Alm ON
8M Remote Alm ON
34M Remote Alm ON
140M Remote Alm ON
2M AIS Alm OFF
8M AIS Alm OFF
34M AIS Alm OFF
140M AIS Alm OFF
TS16 AIS Alm OFF
FAS DIS Alm OFF
MFAS DIS Alm OFF
8M Remote Alm OFF
34M Remote Alm OFF
140M Remote Alm OFF

A

An example of a status message printout is as follows:

Signal Loss 03:35:47 DEC 15 90

APPENDIX B
RESULT ACCUMULATION CRITERIA

B.1 OVERVIEW

The accumulation of analysis results values is affected in different ways when the signal, frame synchronization, or pattern synchronization is lost. Table B-1 lists the result item and the effect each of these signal conditions has on the accumulation of that result.

- “Frozen” indicates that the corresponding accumulation halts when the signal, FAS or pattern is lost.
- “Direct effect” indicates that the loss causes the corresponding results value to change accordingly.
- “No effect” indicates that the loss has no effect on the results value.
- “Unavailable” indicates that the result is not available when the associated loss occurs and X is the data rate.

Table B-1
Result Accumulation Affect

Category/Result	Signal Loss	FAS Loss	Pattern Loss
SUMMARY Bit Errors Pat Slip Pat Loss X Code X Fas CRC Err* REBE* Pwr Loss	Frozen Frozen Direct Effect Frozen Frozen Frozen Frozen Frozen No Effect	Frozen Frozen Direct Effect No Effect Frozen Frozen Frozen Frozen No Effect	Frozen Frozen Direct Effect No Effect No Effect No Effect No Effect No Effect No Effect
LOGIC Bit Errs BER Pat Slip Pat Loss Slip Sec	Frozen Frozen Frozen Direct Effect Frozen	Frozen Frozen Frozen Direct Effect Frozen	Frozen Frozen Frozen Direct Effect Frozen

Table B-1
Result Accumulation Affect (Continued)

Category/Result	Signal Loss	FAS Loss	Pattern Loss
<u>CODE & FRAME</u>			
X Code	Frozen	No Effect	No Effect
X CER	Frozen	No Effect	No Effect
X FAS	Frozen	Frozen	No Effect
X FER	Frozen	Frozen	No Effect
X FSL	No Effect	Direct Effect	No Effect
CRC Err*	Frozen	Frozen	No Effect
CRC Er Rt*	Frozen	Frozen	No Effect
1 Sec CRC*	Frozen	Frozen	No Effect
X FAS Wd	Frozen	Frozen	No Effect
2NFAS Wd	Frozen	Frozen	No Effect
MFAS Err	Frozen	Frozen	No Effect
MFER	Frozen	Frozen	No Effect
MFSL*	No Effect	Direct	No Effect
CRC FSL*	Direct	Direct	No Effect
REBE*	Frozen	Frozen	No Effect
REBE FSL*	Frozen	Frozen	No Effect
TSn ABCD	Frozen	Frozen	No Effect
MFAS Wd	Frozen	Frozen	No Effect
<u>SIGNAL & TIME</u>			
X Rx Freq	Direct Effect	No Effect	No Effect
X Rx ppm	Direct Effect	No Effect	No Effect
X Tx Freq	No Effect	No Effect	No Effect
Test Sec	No Effect	No Effect	No Effect
Time	No Effect	No Effect	No Effect
Elap Sec	No Effect	No Effect	No Effect
Date	No Effect	No Effect	No Effect
Sig Loss	Direct	No Effect	No Effect
<u>ALARMS</u>			
X AIS	Frozen	No Effect	No Effect
TS16 AIS*	Frozen	Frozen	No Effect
FAS Dis	Frozen	Frozen	No Effect
MFAS Dis	Frozen	Frozen	No Effect
X Rmt	Frozen	Frozen	No Effect
Pwr Loss	No Effect	No Effect	No Effect

Table B-1
Result Accumulation Affect (Continued)

Category/Result	Signal Loss	FAS Loss	Pattern Loss
<u>G.821 PERFORMANCE</u>			
Avl Sec	Frozen	Frozen	Frozen
%Avl Sec	Direct Effect	Direct Effect	Direct Effect
Una Sec	Direct Effect	Direct Effect	Direct Effect
Err Sec	Frozen	Frozen	Frozen
SES	Direct Effect	Direct Effect	Direct Effect
%SES	Direct Effect	Direct Effect	Direct Effect
Deg Min	Frozen	Frozen	Frozen
%Deg Min	Frozen	Frozen	Frozen
EFS	Direct Effect	Direct Effect	Direct Effect
%ESF	Direct Effect	Direct Effect	Direct Effect
BER-SES	Frozen	Frozen	Frozen
Err-SES	Frozen	Frozen	Frozen
<u>M.550 IN-SERVICE PERFORMANCE</u>			
ES	Direct Effect	Direct Effect	Direct Effect
EFS	Direct Effect	Direct Effect	Direct Effect
%EFS	Direct Effect	Direct Effect	Direct Effect
<u>M.550 IN-SERVICE PERFORMANCE</u>			
DEF S	Direct Effect	Direct Effect	Direct Effect
SES	Direct Effect	Direct Effect	Direct Effect
%SES	Direct Effect	Direct Effect	Direct Effect
Av T	Direct Effect	Direct Effect	Direct Effect
%Av T	Direct Effect	Direct Effect	Direct Effect
Una T	Direct Effect	Direct Effect	Direct Effect
MRER	No Effect	No Effect	No Effect
<u>M.550 OUT-OF-SERVICE PERFORMANCE</u>			
ES	Direct Effect	Direct Effect	No Effect
EFS	Direct Effect	Direct Effect	No Effect
%EFS	Direct Effect	Direct Effect	No Effect
DEF S	Direct Effect	Direct Effect	No Effect
SES	Direct Effect	Direct Effect	No Effect
%SES	Direct Effect	Direct Effect	No Effect
Av T	Direct Effect	Direct Effect	No Effect
%Av T	Direct Effect	Direct Effect	No Effect
Una T	Direct Effect	Direct Effect	No Effect
* Only available for 2M operation.			

B

APPENDIX C DEFAULT VALUES

C.1 OVERVIEW

Clearing the INTERCEPTOR 1402 memory resets the operating parameters to their default values. The default value is indicated in Table C-1. Many of the results values are determined by the selected data rate (indicated by X) or the number of bits analyzed (indicated by Y).

Table C-1
INTERCEPTOR Default Values

Item:	Default:	Item:	Default:
SUMMARY			
Bit Errs	0	Pat Slip	0
Patt Loss	0	X Code	0
X FAS	0	X FAS Dis	0
XRX ppm	0	CRC Err	0
LOGIC			
Bit Errs	0	BER	0.00E-01
Pat Slip	0	Pat Loss	0
CODE & FRAME			
X Code	0	X CER	0.00E-01
X FAS	0	X FER	0.00E-01
CRC Err	0	CRC E Rt	0.00E-01
1 Sec CRC	0	XFAS Wd	8 or 12 bits
2NFAS Wd	8 bits	MFAS Err	0
MFER	0.00E-01	MFAS Wd	8 bits
REBE	0		
SIGNAL & TIME			
XTX Freq	Rate Dependent	XRX Freq	Rate Dependent
XRX ppm	0	Test Sec	0
Time	Current Time	Elap Sec	0
Date	Current Date		

NOTE: The FAS word and NFAS word is depicted as a sequence of 1's and 0's. If a FAS bit is errored, it is represented by an X in the errored bit position. The number of bits in the FAS word is dependent on the data rate.

Table C-1
INTERCEPTOR Default Values (Continued)

Item:	Default:	Item:	Default:
ALARMS			
XM AIS	Off	TS16 AIS	Off
FAS Dis	Off	MFAS Dis	Off
X Remote	Off		
PERFORMANCE (G.821)			
Avl Sec	0	%Avl Sec	100.00%
Una Sec	0	Err Sec	0
SES	0	%SES	0.00%
Deg Min	0	%Deg Min	0.00%
EFS	0	%EFS	100.00%
BER-SES	0.00E-01	Err-SES	0
PERFORMANCE (M.550)			
Nx Av T	0	Nx Una T	0
Nx %Av T	0.00%	Nx SES	0
Nx %SES	0.00%	Nx DED S	0
Nx MRER	0.0E+0	2M ES	0
2M EFS	0	2M %EFS	0.00%
2M DEF S	0	2M MRER	0.0E+0
2M SES	0	2M %SES	0.00%
2M Av T	0	2M Una T	0
2M %Av T	0.00%	8M ES	0
8M EFS	0	8M %EFS	0.00%
8M DEF S	0	8M SES	0
8M %SES	0.00%	8M Av T	0
8M Una T	0	8M %Av T	0.00%
8M MRER	0.0E+0	34M ES	0
34M EFS	0	34M %EFS	0.00%
34M DEF S	0	34M SES	0
34M %SES	0.00%	34M Av T	0
34M Una T	0	34M %Av T	0.00%
34M MRER	0.0E+0	140M ES	0
140M EFS	0	140M %EFS	0.00%
140M DEF S	0	140M SES	0
140M %SES	0.00%	140M Av T	0
140M Una T	0	140M %Av T	0.00%
140M MRER	0.0E+0		

APPENDIX D

CCITT G.821 PERFORMANCE ANALYSIS DISCUSSION

D.1 INTRODUCTION

This appendix describes the criteria for performance analysis, the concept of available time versus unavailable time, and degraded minutes as specified in CCITT Recommendation G.821. This appendix is provided to familiarize users with the G.821 Performance results.

D.2 PERFORMANCE ANALYSIS RESULTS

The performance results listed in Table D-1 are derived by observing the received bit error counts and received bit counts at 1-second intervals, and classifying each 1-second interval as either available, unavailable, severely errored, errored, or error free seconds. This division of test time is illustrated in Figure D-1. Further calculations yield the number and percentage of degraded minutes, and percentages of available, severely errored, and error free seconds.

Table D-1
Performance Category Results

Displayed Results	Description
%AVL SEC	Percent of Available Seconds
%DEG MIN	Percent of Degraded Minutes
%SES	Percent of Severely Errored Seconds
AVL SEC	Available Seconds
DEG MIN	Degraded Minutes
%EFS	G.821 Percent of Error Free Seconds
EFS	G.821 Error Free Seconds
ERR SEC	G.821 Errored Seconds
SES	Severely Errored Seconds
UNA SEC	Unavailable Seconds
BER-SES	Bit Error Rate SES
ERR SES	Bit Errors SES

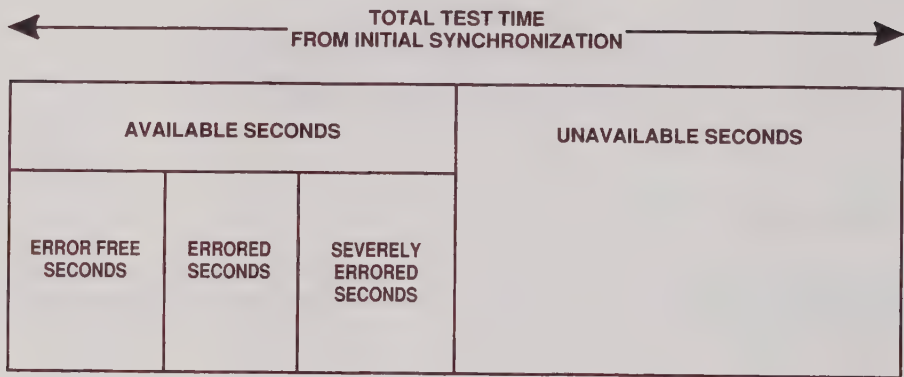


Figure D-1
Division of Test Seconds for Performance Analysis

D.3 DETERMINING AVAILABLE AND UNAVAILABLE SECONDS

CCITT Recommendation G.821 defines available and unavailable time as follows.

“A period of unavailable time begins when the bit error rate (BER) in each second is worse than 10^{-3} for a period of 10 consecutive seconds. These 10 seconds are considered to be unavailable time. The period of unavailable time terminates when the BER in each second is better than 10^{-3} for a period of 10 consecutive seconds. These 10 seconds are considered to be available time.”

Available and unavailable time are measured in seconds — available seconds (AVL SEC) and unavailable seconds (UNA SEC), respectively. All seconds after initial pattern synchronization must fall into one of the two categories (total AVL SEC + total UNA SEC = total seconds after initial pattern synchronization).

After initial pattern synchronization, seconds are considered to be available time; the AVL SEC begin counting (seconds before initial pattern synchronization are not included in performance analysis). These seconds continue to be counted until 10 consecutive seconds, each with a BER greater than 10^{-3} , occur. A sliding window, 10 seconds in length, is used to detect this transition from available time to unavailable time and vice versa.

As an example, assume a test begins and continues to run for 25 seconds and each of those 25 seconds has a BER less than or equal to 10^{-3} . After the initial pattern synchronization, the seconds are considered to be available time, so the AVL SEC count at this point is 25 as shown in Figure D-2. In the 26th second, the BER becomes greater than 10^{-3} . The same for the 27th and 28th seconds. In the 29th second, the BER improves to less than or equal to 10^{-3} . All 29 seconds are a part of available time and are, therefore, counted as AVL SEC.

Even though there were 3 consecutive seconds (the 26th, 27th, and 28th) which each had a BER greater than 10^{-3} , 10 such consecutive seconds are required to make the transition to unavailable time. Those 3 individual seconds are still in available time and they are counted as AVL SEC.

sec 20	sec 21	sec 22	sec 23	sec 24	sec 25	sec 26	sec 27	sec 28	sec 29
BER	BER	BER	BER	BER	BER	BER	BER	BER	BER
<=	<=	<=	<=	<=	<=	>	>	>	<=
IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3

Figure D-2
Sliding Window After 29th Test Second
Still in Available Time

The 3 seconds with a BER greater than 10^{-3} are also included in the count of severely errored seconds (SES), which are those seconds with a BER greater than 10^{-3} that occur in available time. A signal loss second or a second in which pattern synchronization is lost is also considered to be a second with a BER greater than 10^{-3} . Therefore, the current test result values for the AVL SEC count = 29; the SES count = 3 and the UNA SEC count = 0.

sec 79	sec 80	sec 81	sec 82	sec 83	sec 84	sec 85	sec 86	sec 87	sec 88
BER	BER	BER	BER	BER	BER	BER	BER	BER	BER
<=	>	>	>	>	>	>	>	>	>
IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3

Figure D-3
Sliding Window After 88th Test Second
Still in Available Time

The same test continues to run and remains in available time. In the 80th second, the BER for that second is greater than 10^{-3} as shown in Figure D-3. The BER for the 81st through the 85th seconds is also greater than 10^{-3} . In the 86th second, pattern synchronization is lost. This also continues for the 87th and 88th seconds. We now have 9 consecutive seconds each of which has a BER worse than 10^{-3} . As each of these seconds occurs, we are still in available time, so they are counted as AVL SEC and SES. The transition has not been made from available time to unavailable time.

Figure D-4 shows the 89th second also has a BER greater than 10^{-3} . At this point, the AVL SEC count = 89, the SES count = 13, and the UNA SEC count = 0. However, the sliding window now contains 10 consecutive seconds each having a BER worse than 10^{-3} . At this point the transition is made to unavailable time.

Those 10 seconds which had been counted as AVL SEC are deducted from the AVL SEC count and are added to the UNA SEC count; the AVL SEC count becomes 79, and the UNA SEC count becomes 10. Those same 10 seconds were also included in the SES count. However, SES is limited to only those seconds in available time which have a BER greater than 10^{-3} ; therefore, those last consecutive 10 seconds must also be deducted from the SES count (the SES count is updated to 3).

sec 80	sec 81	sec 82	sec 83	sec 84	sec 85	sec 86	sec 87	sec 88	sec 89
BER	BER	BER	BER	BER	BER	BER	BER	BER	BER
>	>	>	>	>	>	>	>	>	>
IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3

Figure D-4
Sliding Window After 89th Test Second
Transition to Unavailable Time

Once the transition occurs from available time to unavailable time, all seconds are counted as UNA SEC until 10 consecutive seconds occur each with a BER less than 10^{-3} . As the sample test continues, the 90th through 150th seconds each have a BER greater than or equal to 10^{-3} . We are still in unavailable time, so these seconds are counted as UNA SEC; now the total AVL SEC count = 79 and the total UNA SEC count = 71.

sec 151	sec 152	sec 153	sec 154	sec 155	sec 156	sec 157	sec 158	sec 159	sec 160
BER	BER	BER	BER	BER	BER	BER	BER	BER	BER
<	<	<	<	<	<	<	<	<	<
IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3

Figure D-5
Sliding Window After 160th Test Second
Transition to Available Time

Beginning with the 151st second, the BER for that second is less than 10^{-3} , as shown in Figure D-5. It is still counted as an UNA SEC since we are still in unavailable time and the transition has not been made to available time. A BER less than 10^{-3} also occurs for the 152nd through the 160th seconds. Since there are now 10 consecutive seconds with a BER less than 10^{-3} , the transition is made from unavailable time to available time.

As each of these 10 seconds occurred, it was added to the UNA SEC count (UNA SEC = 81, AVL SEC = 79, and SES = 3). Now that those consecutive seconds have triggered the transition to available time, they are deducted from the UNA SEC count and added to the AVL SEC count. Now the UNA SEC count = 71 and the AVL SEC count = 89.

The monitoring of available and unavailable time continues for the duration of the test.

D.4 DETERMINING DEGRADED MINUTES

Degraded minutes (DEG MIN) is an error analysis result that is affected by available and unavailable time. DEG MIN is a count of the number of minutes during which an average BER greater than 10^{-6} occurs. The 1-minute intervals are derived by removing UNA SEC and SES from the total test time and then consecutively grouping the remaining seconds into blocks of 60. The average BER is calculated for the block of 60 seconds and, if it is greater than 10^{-6} , the block is counted as a degraded minute.

In the transition from available time to unavailable time, the DEG MIN result is unaffected. This is because a switch to unavailable time requires 10 consecutive seconds each with a BER greater than 10^{-3} . Any second in available time with a BER greater than 10^{-3} is considered to be a severely errored second and, therefore, not included in the accumulation of seconds used to calculate DEG MIN.

Moving from unavailable time to available time may affect the DEG MIN count. While in unavailable time, 10 consecutive seconds each with a BER less than 10^{-3} are required for the transition to available time. When this happens, those 10 seconds are subtracted from the UNA SEC count and are added to the AVL SEC count. Since these seconds are now considered to be a part of available time and they are not SES, they are included in the calculation of DEG MIN.

D

APPENDIX E

CCITT M.550 PERFORMANCE ANALYSIS DISCUSSION

E.1 INTRODUCTION

This appendix discusses the criteria for performance analysis as specified in CCITT Recommendation M.550. This discussion is to familiarize the users with the M.550 performance results available in the INTERCEPTOR 1402.

The following discussion assumes a basic understanding of G.821 performance analysis and its implementation.

E.2 M.550 TEST CAPABILITIES

M.550 is designed to be used for both in-service and out-of-service long term performance analysis. A discussion of the need and use for each method in different applications is contained in the following paragraphs.

E.2.1 Using M.550 for In-Service Monitoring

The strength of M.550 performance analysis is its ability to derive performance statistics on an operational maintenance entity, such as an in-service multiplexer or line. The M.550 recommendation uses the term Maintenance Entity to describe any piece(s) of equipment under test (or being monitored).

Unlike its out-of-service-only counterpart G.821, M.550 works on more than bit errors and loss of pattern synchronization. In G.821, a loss of pattern sync or a bit error rate in excess of $1\text{E-}3$ causes a Severely Errored Second. This may also cause a transition from Available to Unavailable Time. While M.550 uses the same criteria during out-of-service tests, it also uses them to frame errors, code errors, CRC errors, AIS, loss of signal, loss of frame sync, and remote end block errors.

Since there is not a direct correlation between bit errors and the other anomalies, M.550 defines equivalencies for them in Table E-4. These equivalencies are made to permit monitoring on live-data (in-service) lines where there are no distinct patterns available for testing. Through its use of error rates, equivalent to a bit error rate of $1\text{E-}3$, M.550 offers similar performance results without taking valuable transmission resources off-line. This type of monitoring detects problems before they become severe and allows for non-intrusive troubleshooting.

E.2.2 Using M.550 for Out-Of-Service Testing

Like G.821, M.550 performance results can be used for out-of-service testing. M.550 out-of-service testing offers more precise results than G.821, since its performance analysis calculations are based on more than bit errors.

Out-of-service analysis results are similar to the in-service results, except that bit errors are counted as anomalies at the analysis rate. Also, pattern sync losses become valid defects at the analysis rate.

E.2.3 Using the Custom Performance Mode

Service providers need the ability to tighten or modify existing standards (G.821, M.550, or any other) to keep pace with evolving customer requirements. The INTERCEPTOR 1402's custom performance mode provides the user with the ability to enable or disable one or more anomalies or defects. It also allows the threshold for each anomaly to be changed or returned to its standard value for each rate.

E.3 PERFORMANCE ANALYSIS RESULTS

M.550 results are based on two types of errors on a transmission line, which are defects and anomalies.

Anomaly- This is a single error event in the data stream. Typically, this type of error is intermittent or non-continuous in nature.

Defect- This is an error condition that may exist for an extended time period.

Table E-1 classifies each error type as either an anomaly or a defect.

Table E-1
M.550 Error Classification

Defects:	Anomalies:
Signal Loss Frame Synchronization Loss Remote Alarm Pattern Sync Loss ²	Frame (FAS) Errors CRC Errors ¹ Code Errors AIS Alarms Remote End Block Errors ¹ Bit Errors ²
¹ Only available at 2M when CRC is enabled. ² Only available for Out-Of-Service testing.	

When using the INTERCEPTOR 1402 to perform an M.550 in-service, out-of-service, or custom performance test, all the results are calculated simultaneously for all rates from the input rate down through the analysis rate. For example, if the input rate is 140M and the analysis rate is 2M, all results for 140M, 34M, 8M, and 2M are available by scrolling through the results visible in the results display window.

Table E-2 shows the description of each result. Table E-3 provides a brief definition of these results.

Table E-2
M.550 Performance Category Results

Displayed Results:	Description:
XX ES	Errored Second
XX EFS	Error Free Second
XX %EFS	Percentage Error Free Seconds
XX DEF S	Defect Second
XX SES	Severely Errored Seconds
XX %SES	Percentage Severely Errored Seconds
XX AV T	Available Time
XX Una T	Unavailable Time
XX %AV T	Percentage Available Time
XX MRER	Mean Residual Error Rate

XX refers to the data rate 2 (2M), 8 (8M), 34 (34M), 140 (140M), and Nx (for rates below 2M). Since M.550 test can be performed on a complete path (64k to 140M) at the same time, a rate indication appears next to each result to distinguish between rates.

Table E-3
M.550 Results Definition

Errored Second	Total number of Available Seconds with a defect or an anomaly.
Error Free Second	Total number of Available Seconds without an anomaly or a defect.
% Error Free Seconds	The ratio of Error Free Seconds to Available Seconds.
Defect Seconds	The total number of Available Seconds in which a defect was detected.
Severely Errored Seconds	The number of Available Seconds with any defects or an anomaly rate exceeding the specified error rate in Table E-4. For each anomaly at each rate there is a predetermined error rate that is used to approximate the bit error rate of 1E-3. (For further information refer to Defining Severely Errored Seconds following this table.)
% Severely Errored Seconds	The ratio of Severely Errored Seconds to Available Time.

Table E-3
M.550 Results Definition (Continued)

Available Time	Every second is classified as either Available Time or Unavailable Time. The test starts in Available Time. All seconds will continue in Available Time until there are ten consecutive Severely Errored Seconds, at which time those ten seconds and all subsequent seconds transition to Unavailable Time. The transition can also occur in the opposite direction from Unavailable Time to Available Time.
Unavailable Time	Unavailable Time begins with ten consecutive Severely Errored Seconds. Unavailable Time continues until there are ten consecutive Non-Severely Errored Seconds, at which time those ten seconds and all subsequent seconds transition to Available Time. The transition can also occur in the opposite direction from Available Time to Unavailable Time.
Percentage Available Time	The ratio of Available Time to Test Seconds.
Mean Residual Error Rate	The bit error rate for all Non-Severely Errored Seconds that are in Available Time.

E.4 DEFINING SEVERELY ERRORED SECONDS

Using Defects

Any second in which a defect occurs is considered a Severely Errored Second.

Using Anomalies

A second with an excessive number of anomalies is also considered a Severely Errored Second. The default anomaly rate thresholds for Severely Errored Seconds are shown in Table E-4.

Table E-4
Severely Errored Second Thresholds
(In Anomalies per second)

Data Rate Anomaly	2M	8M	34M	140M
Bit Err	>1E-3	>1E-3	>1E-3	>1E-3
Code Err	2048	8448	34368	208896
FAS Err	28	99	223	568
CRC Err	830	—	—	—
REBE	830	—	—	—

The thresholds for Nx64K analysis are not listed in Table E-4 for two reasons. First, Bit Errors is the only anomaly defined for Nx64. Second, the number of possible bit rates available for Nx64K is so large that the table could not contain all the entries.

In general the bit error thresholds can be computed from the following formula:

$$\text{SES Threshold} = \text{NN} / 1000$$

Where NN is the data rate in bits per second. This gives the SES threshold in bit errors per second.

E.5 DETERMINING AVAILABLE AND UNAVAILABLE SECONDS

CCITT Recommendation M.550 defines available and unavailable seconds similar to the G.821 definition. However, G.821 considers bit errors as the only condition used to determine available time, while M.550 uses any or all conditions defined in Table E-4. CCITT Recommendation M.550 defines this as follows.

“A period of unavailable time begins when 10 consecutive Severely Errored Seconds are detected. These 10 seconds are considered to be unavailable time. The period of unavailable time continues until 10 consecutive non-severely errored seconds are detected. These 10 seconds are considered to be included in available time.

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**ADDENDUM
FOR INTERCEPTOR 1402 MANUAL
REVISION B**

This addendum is included as a supplement to the INTERCEPTOR 1402 Reference Manual. Its purpose is to describe an additional feature of the instrument incorporated after publication of the reference manual. This capability, the selection of either the FAS bit or FAS word for analysis is described as follows.

SECTION 2.4.2 CONTROLS AND INDICATORS

An additional AUXILIARY menu has been included as shown:

FAS RESULTS:	XXXX
WORD	BIT

WORD - Selection of this choice will produce FAS results derived from a count of FAS Word errors. A single FAS Word error will be counted even if the FAS Word contains multiple FAS bits errors. Example: If the FAS word contains three bits in error the result will indicate 1 FAS error.

BIT - Selection of this choice will produce FAS results derived from a count of FAS Bits errors. If a FAS Word includes multiple FAS bit errors, each bit in error will be counted separately. Example: If the FAS word contains three FAS bits in error, the result will indicate 3 FAS errors.

Note: This feature applies to FAS errors "FAS ERR" and FAS error rate "FER" for all transmission rates. Insertion of FAS errors is unaffected by this AUXILIARY function.

SECTION 2.4.4 AUXILIARY MENU SELECTION

- | | |
|-----------------|---|
| 1A. FAS RESULTS | Permits the user to display the FAS results based on FAS "BIT" errors or FAS "WORD" errors. |
|-----------------|---|

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